Research Article

On Topological Analysis of Entropy Measures for Silicon Carbides Networks

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The silicon material has provoked and stimulated significant research concern to a considerable extent taking into account its marvelous mechanical, optical, and electronic properties. Naturally, silicones are semiconductors and are utilized in the formation of various materials. For example, it is used in assembling the electronic based gadgets. In this article, we have studied the 2D structure of silicon carbide $Si_2C_3 - I[m, n]$ and $Si_2C_3 - II[m, n]$ and then continued to discuss some degree grounded topological descriptors in association with their corresponding entropy measures. We extend this computation to the quantitative and pictorial comparisons which could be beneficial in the structure amendment for effective implementation.

1. Introduction

Chemical graph theory is a fascinating branch of mathematics and is the combination of chemistry and graph theory. In molecular graph, molecules are designed mathematically. In a molecular graph, the vertices and edges portrayed the atoms and the bonds correspondingly. Various approaches are employed on molecular graphs to acquire various structure properties of corresponding compounds. A numerical worth treated theoretically from the atomic graph is named as topological index. It is connected with synthetic constitution exhibiting for association of substance structure with miscellaneous physical and natural exercises and concoction properties. The degree-based topological indices collaborate actively in the exploitation of different fields specifically in pharmaceutical and commercial chemistry. In [1], Randić index is originated, while ABC index, GA index, first Zagreb index, and second Zagreb were discussed in [2, 3]. In [4], hyper-Zagreb index was introduced. In [5], forgotten index was initiated.

Furtula [6] established the concept of AZI index. Balaban [7, 8] laid the foundation of Balaban index. The redefined first, second, and third Zagreb indices were investigated in [9]. The forth atom bond connectivity index was presented in [10]. The fifth geometric arithmetic index is declared in [11]. The specific topological indices of some graphs are discussed in [12, 13]. An ordered pair (M_V, M_E) , composed of a nonempty set M_V of vertices and M_E as a set of edges, is called a graph. If any two vertices m and n are attached with each other, they make an edge e . The number of edges adjacent with the vertex m is characterized as $\tau(m)$.

Entropy has been a comprehensive and transcendental approach in diverse areas of expertise diverging from logic and biology to physics and engineering. Entropy connects the conception of randomness and uncertainty with physical conditions which are constructed as transformation channels of information. This study represents the special case when these channels are the detectors investigating the response of a system. Formally, entropy came into consideration after the invention of the heat engine, as a

consequence of pioneering investigation towards explaining thermodynamical techniques and expanding the efficacy of such machines [14, 15]. This investigation reveals that the entropy of a system or machine cannot decrease over time. In 1948, Claude Shannon [16] introduces a measure of uncertainty as entropy. It can be explicated as the rate of production of new information manufactured by the system [17–19]. As stated by Shannon, uncertainty and information are two sides of the coin: a reduction in uncertainty is the same as the reception of a certain amount of information. Therefore, as the value of the entropy about a system is greater, the uncertainty about its response is also increased. In literature, many graph entropies are estimated; see [20–23].

In 2014, Chen et al. [24] introduced the definition of the entropy of edge weighted graph $M = (M_V; M_E; \psi(mn))$. The entropy formula is represented in

$$\begin{aligned} E_\psi(M) &= - \sum_{i=1}^m F_i \frac{\psi(m_i n_i)}{I} \log \frac{\psi(m_i n_i)}{I} \\ &= \log(I) - \frac{1}{I} \sum_{i=1}^m F_i \psi(m_i n_i) \log \psi(m_i n_i). \end{aligned} \quad (1)$$

2. Crystallographic Structure of $\text{Si}_2\text{C}_3 - I[m, n]$

The most consistent framework of 2D silicon carbon unicellular compound is anticipated which is grounded on the (PSO) particle swarm optimization approach. It is rich in carbon. In the last decades, silicon carbon was considered to be the hardest material across the world. Due to its Mohs hardness rating, it resembles diamond. Silicon is of low cost and is nontoxic semiconductor. Numerous studies have been done in the refinement, magnification, and device assembling [25]. It is employed for all advanced electronic gadgets. The silicon carbide framework may seem like the honeycomb framework of graphene. Despite that, large scale search proposes that the framework of this compound is absolutely distinct compared to that of graphene. For silicon carbide I (Si_2C_3) layer, the minimum energy of $\text{Si}_2\text{C}_3 - I$ demonstrates a planar framework comprised of polygonal rings, where two pentagonal and four heptagonal rings encircling each hexagonal ring. See Figure 1 [26]. Every hexagonal ring carries out three Si and three C atoms in which Si and C atoms are positioned by turn on the vertices. Pentagonal rings are of two kinds in which one is comprised of two Si and three C atoms. Also, three Si and four C atoms establish the heptagonal rings. It is to be noted that there are no Si–Si bonds in $\text{Si}_2\text{C}_3 - I$ sheet. Here m denotes the total associated unit cells in each row while n shows the total sum of associated rows with m number of cells.

Figure 2 illustrates the way in which cells are associated in a row and the way of association of rows with each other. Also, $|V(\text{Si}_2\text{C}_3 - I)| = 10mn$ and $|E(\text{Si}_2\text{C}_3 - I)| = 3(5mn - n) - 2m$.

2.1. Formation of $\text{Si}_2\text{C}_3 - I[m, n]$ Formulas. Here, we join one unit cell with another unit cell and then continue this process horizontally till n unit cells. Similar technique will be

applied for vertical direction. As a result, we will obtain the $\text{Si}_2\text{C}_3 - I[m, n]$ sheet; see Figure 1. The vertex and edge partition are depicted in Tables 1 and 2, respectively.

Table 3 shows the edge partition of the chemical graph $\text{Si}_2\text{C}_3 - I[m, n]$ based on degree sum of end vertices.

2.2. Computation of Entropies for Crystallographic Structure of $\text{Si}_2\text{C}_3 - I[m, n]$. This portion deals with the computation of topological indices and their corresponding graph entropies for the crystallographic structure of $\text{Si}_2\text{C}_3 - I[m, n]$.

2.2.1. The Randić Index and Randić Entropy for $\text{Si}_2\text{C}_3 - I[m, n]$. For $\alpha = 1$, the Randić index and Randić entropy by using Table 2 are

$$R_1(\text{Si}_2\text{C}_3 - I) = 135mn - 41m - 61n + 14,$$

$$E_{R_1}(\text{Si}_2\text{C}_3 - I) = \log[135mn - 41m - 61n + 14]$$

$$\begin{aligned} & - \frac{\log(2)^{(2)}}{135mn - 41m - 61n + 14} \\ & - \frac{\log(3)^{(3)}}{135mn - 41m - 61n + 14} \\ & - \frac{\log[(m+2n) \times (4)^{(4)}]}{135mn - 41m - 61n + 14} \\ & - \frac{\log[(6m+8n-9) \times (6)^{(6)}]}{135mn - 41m - 61n + 14} \\ & - \frac{\log[(15mn-9m-13n+7) \times (9)^{(9)}]}{135mn - 41m - 61n + 14}. \end{aligned} \quad (2)$$

For $\alpha = -1$, by using Table 2, the Randić index and Randić entropy are

$$R_{-1}(\text{Si}_2\text{C}_3 - I) = \frac{5mn}{3} + \frac{m}{4} + \frac{7n}{18} + \frac{1}{9},$$

$$E_{R_{-1}}(\text{Si}_2\text{C}_3 - I) = \log\left(\frac{5}{3}mn + \frac{1}{4} + \frac{7}{18}n + \frac{1}{9}\right)$$

$$\begin{aligned} & - \frac{\log[(2)^{(-1/2)}]}{((5/3)mn + (1/4)4 + (7/18)n + (1/9))} \\ & - \frac{\log[(3)^{(-1/3)}]}{((5/3)mn + (1/4)4 + (7/18)n + (1/9))} \\ & - \frac{\log[(m+2n) \times (4)^{(-1/4)}]}{((5/3)mn + (1/4)4 + (7/18)n + (1/9))} \\ & - \frac{\log[(6m+8n-9) \times (6)^{(-1/6)}]}{((5/3)mn + (1/4)4 + (7/18)n + (1/9))} \\ & - \frac{\log[(15mn-9m-13n+7) \times (9)^{(-1/9)}]}{((5/3)mn + (1/4)4 + (7/18)n + (1/9))}. \end{aligned} \quad (3)$$

FIGURE 1: (a) Unit cell of $\text{Si}_2\text{C}_3 - I[m, n]$; (b) $\text{Si}_2\text{C}_3 - I[4, 3]$. FIGURE 2: (a) $\text{Si}_2\text{C}_3 - I[4, 1]$, one row with $m = 4$ and $n = 1$; (b) $\text{Si}_2\text{C}_3 - I[4, 2]$.TABLE 1: Vertex partition of $\text{Si}_2\text{C}_3 - I[m, n]$.

$\tau(m)$	Frequency	Kind of vertices
1	2	M_{V_1}
2	$4m + 6n - 4$	M_{V_2}
3	$10mn - 4m - 6n + 2$	M_{V_3}

TABLE 2: Edge partition of $\text{Si}_2\text{C}_3 - I[m, n]$.

$(\tau(m), \tau(n))$	Frequency	Set of edges
(2, 1)	1	M_{E_1}
(3, 1)	1	M_{E_2}
(2, 2)	$m + 2n$	M_{E_3}
(3, 2)	$6m + 8n - 9$	M_{E_4}
(3, 3)	$15mn - 9m - 13n + 7$	M_{E_5}

TABLE 3: Edge partition of $\text{Si}_2\text{C}_3 - I[m, n]$ with $m, n \geq 2$.

(S_m, S_n)	Frequency
(4, 2)	1
(5, 3)	1
(5, 5)	$m + 2n$
(5, 5)	1
(7, 4)	1
(7, 5)	$2 + 2n$
(5, 6)	1
(7, 6)	$-7 + 2(2m + n)$
(8, 6)	$2(-1 + n)$
(8, 5)	$-5 + 2(m + n)$
(8, 7)	1
(8, 8)	$-4 + 2n + m$
(9, 7)	$-3 + 2(m + n)$
(9, 8)	$-7 + 2(m + 2n)$
(9, 9)	$15mn - 14m - 21n + 20$

For $\alpha = 1/2$, by using Table 2, the Randić index and Randić entropy are

$$\begin{aligned}
 R_{1/2}(\text{Si}_2\text{C}_3 - I) &= 45mn + (6\sqrt{6} - 27)m + (8\sqrt{6} - 35)n + \sqrt{2} + \sqrt{3} - 9\sqrt{6} + 21, \\
 E_{R_{1/2}}(\text{Si}_2\text{C}_3 - I) &= \log(45mn + (6\sqrt{6} - 27)m + (8\sqrt{6} - 35)n + \sqrt{2} + \sqrt{3} - 9\sqrt{6} + 21) \\
 &\quad - \frac{\log\left[1 \times (2)^{((1/2) \cdot \sqrt{2})}\right]}{(45mn + (6\sqrt{6} - 27)m + (8\sqrt{6} - 35)n + \sqrt{2} + \sqrt{3} - 9\sqrt{6} + 21)} \\
 &\quad - \frac{\log\left[1 \times (3)^{((1/2) \cdot \sqrt{3})}\right]}{(45mn + (6\sqrt{6} - 27)m + (8\sqrt{6} - 35)n + \sqrt{2} + \sqrt{3} - 9\sqrt{6} + 21)} \\
 &\quad - \frac{\log\left[(m + 2n) \times (4)^{((1/2) \cdot \sqrt{4})}\right]}{(45mn + (6\sqrt{6} - 27)m + (8\sqrt{6} - 35)n + \sqrt{2} + \sqrt{3} - 9\sqrt{6} + 21)} \\
 &\quad - \frac{\log\left[(6m + 8n - 9) \times (6)^{((1/2) \cdot \sqrt{6})}\right]}{(45mn + (6\sqrt{6} - 27)m + (8\sqrt{6} - 35)n + \sqrt{2} + \sqrt{3} - 9\sqrt{6} + 21)} \\
 &\quad - \frac{\log\left[(15mn - 9m - 13n + 7) \times (9)^{((1/2) \cdot \sqrt{9})}\right]}{(45mn + (6\sqrt{6} - 27)m + (8\sqrt{6} - 35)n + \sqrt{2} + \sqrt{3} - 9\sqrt{6} + 21)}.
 \end{aligned} \tag{4}$$

For $\alpha = -1/2$, by using and Table 2, the Randić index and Randić entropy are

$$\begin{aligned}
 R_{-1/2}(\text{Si}_2\text{C}_3 - I) &= 5mn + \left(\sqrt{6} - \frac{5}{2}\right)m + \left(\frac{8}{\sqrt{6}} - \frac{10}{3}\right)n + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} - \frac{9}{\sqrt{6}} + \frac{7}{3}, \\
 E_{R_{-1/2}}(\text{Si}_2\text{C}_3 - I) &= \log\left(5mn + \left(\sqrt{6} - \frac{5}{2}\right)m + \left(\frac{8}{\sqrt{6}} - \frac{10}{3}\right)n + \frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} - \frac{9}{\sqrt{6}} + \frac{7}{3}\right) \\
 &\quad - \frac{\log\left[1 \times (2)^{((-1/2) \cdot (1/\sqrt{2}))}\right]}{(5mn + (\sqrt{6} - (5/2))m + ((8/\sqrt{6}) - (10/3))n + (1/\sqrt{2}) + (1/\sqrt{3}) - (9/\sqrt{6}) + (7/3))} \\
 &\quad - \frac{\log\left[1 \times (3)^{((-1/2) \cdot (1/\sqrt{3}))}\right]}{(5mn + (\sqrt{6} - (5/2))m + ((8/\sqrt{6}) - (10/3))n + (1/\sqrt{2}) + (1/\sqrt{3}) - (9/\sqrt{6}) + (7/3))} \\
 &\quad - \frac{\log\left[(m + 2n) \times (4)^{((-1/2) \cdot (1/\sqrt{4}))}\right]}{(5mn + (\sqrt{6} - (5/2))m + ((8/\sqrt{6}) - (10/3))n + (1/\sqrt{2}) + (1/\sqrt{3}) - (9/\sqrt{6}) + (7/3))} \\
 &\quad - \frac{\log\left[(6m + 8n - 9) \times (6)^{((-1/2) \cdot (1/\sqrt{6}))}\right]}{(5mn + (\sqrt{6} - (5/2))m + ((8/\sqrt{6}) - (10/3))n + (1/\sqrt{2}) + (1/\sqrt{3}) - (9/\sqrt{6}) + (7/3))} \\
 &\quad - \frac{\log\left[(15mn - 9m - 13n + 7) \times (9)^{((-1/2) \cdot (1/\sqrt{9}))}\right]}{(5mn + (\sqrt{6} - (5/2))m + ((8/\sqrt{6}) - (10/3))n + (1/\sqrt{2}) + (1/\sqrt{3}) - (9/\sqrt{6}) + (7/3))}.
 \end{aligned} \tag{5}$$

2.2.2. The ABC Index and ABC Entropy of $\text{Si}_2\text{C}_3 - I[m, n]$.

By using Table 2, the ABC index and ABC entropy are

$$\begin{aligned}
ABC(\text{Si}_2\text{C}_3 - I) &= 10mn + \left(\frac{6}{\sqrt{2}} + \frac{1}{\sqrt{2}} - 6\right)m + \left(\frac{2}{\sqrt{2}} + \frac{8}{\sqrt{2}} - \frac{26}{3}\right)n - \frac{8}{\sqrt{2}} + \sqrt{\frac{2}{3}} + \frac{14}{3}, \\
E_{ABC}(\text{Si}_2\text{C}_3 - I) &= \log\left(10mn + \left(\frac{6}{\sqrt{2}} + \frac{1}{\sqrt{2}} - 6\right)m + \left(\frac{2}{\sqrt{2}} + \frac{8}{\sqrt{2}} - \frac{26}{3}\right)n - \frac{8}{\sqrt{2}} + \sqrt{\frac{2}{3}} + \frac{14}{3}\right) \\
&\quad - \frac{\log\left[1 \times (1/\sqrt{2})^{(1/\sqrt{2})}\right]}{(10mn + ((6/\sqrt{2}) + (1/\sqrt{2}) - 6)m + ((2/\sqrt{2}) + (8/\sqrt{2}) - (26/3))n - (8/\sqrt{2}) + \sqrt{(2/3)} + (14/3))} \\
&\quad - \frac{\log\left[1 \times (\sqrt{(2/3)})^{(\sqrt{(2/3)})}\right]}{(10mn + ((6/\sqrt{2}) + (1/\sqrt{2}) - 6)m + ((2/\sqrt{2}) + (8/\sqrt{2}) - (26/3))n - (8/\sqrt{2}) + \sqrt{(2/3)} + (14/3))} \\
&\quad - \frac{\log\left[(m + 2n) \times (1/\sqrt{2})^{(1/\sqrt{2})}\right]}{(10mn + ((6/\sqrt{2}) + (1/\sqrt{2}) - 6)m + ((2/\sqrt{2}) + (8/\sqrt{2}) - (26/3))n - (8/\sqrt{2}) + \sqrt{(2/3)} + (14/3))} \\
&\quad - \frac{\log\left[(6m + 8n - 9) \times (1/\sqrt{2})^{(1/\sqrt{2})}\right]}{(10mn + ((6/\sqrt{2}) + (1/\sqrt{2}) - 6)m + ((2/\sqrt{2}) + (8/\sqrt{2}) - (26/3))n - (8/\sqrt{2}) + \sqrt{(2/3)} + (14/3))} \\
&\quad - \frac{\log\left[(15mn - 9m - 13n + 7) \times (2/3)^{(2/3)}\right]}{(10mn + ((6/\sqrt{2}) + (1/\sqrt{2}) - 6)m + ((2/\sqrt{2}) + (8/\sqrt{2}) - (26/3))n - (8/\sqrt{2}) + \sqrt{(2/3)} + (14/3))}.
\end{aligned} \tag{6}$$

2.2.3. The GA Index and GA Entropy of $\text{Si}_2\text{C}_3 - I[m, n]$.

By using Table 2, the GA index and GA entropy are

$$\begin{aligned}
GA(\text{Si}_2\text{C}_3 - I) &= 15mn + \left(\frac{12\sqrt{6}}{5} - 8\right)m + \left(\frac{16\sqrt{6}}{5} - 11\right)n + \frac{2\sqrt{2}}{3} + \frac{\sqrt{3}}{2} - \frac{18\sqrt{6}}{5} + 7, \\
E_{GA}(\text{Si}_2\text{C}_3 - I) &= \log\left[15mn + \left(\frac{12\sqrt{6}}{5} - 8\right)m + \left(\frac{16\sqrt{6}}{5} - 11\right)n + \frac{2\sqrt{2}}{3} + \frac{\sqrt{3}}{2} - \frac{18\sqrt{6}}{5} + 7\right] \\
&\quad - \frac{\log\left[1 \times [(2\sqrt{2}/3)]^{[(2\sqrt{2}/3)]}\right]}{(15mn + ((12\sqrt{6}/5) - 8)m + ((16\sqrt{6}/5) - 11)n + (2\sqrt{2}/3) + (\sqrt{3}/2) - (18\sqrt{6}/5) + 7)} \\
&\quad - \frac{\log\left[1 \times [(\sqrt{3}/2)]^{[(\sqrt{3}/2)]}\right]}{(15mn + ((12\sqrt{6}/5) - 8)m + ((16\sqrt{6}/5) - 11)n + (2\sqrt{2}/3) + (\sqrt{3}/2) - (18\sqrt{6}/5) + 7)} \\
&\quad - \frac{\log[1 \times (m + 2n)]}{(15mn + ((12\sqrt{6}/5) - 8)m + ((16\sqrt{6}/5) - 11)n + (2\sqrt{2}/3) + (\sqrt{3}/2) - (18\sqrt{6}/5) + 7)} \\
&\quad - \frac{\log\left[(6m + 8n - 9) \times [(2\sqrt{6}/5)]^{[(2\sqrt{6}/5)]}\right]}{(15mn + ((12\sqrt{6}/5) - 8)m + ((16\sqrt{6}/5) - 11)n + (2\sqrt{2}/3) + (\sqrt{3}/2) - (18\sqrt{6}/5) + 7)} \\
&\quad - \frac{\log[(15mn - 9m - 13n + 7) \times 1]}{(15mn + ((12\sqrt{6}/5) - 8)m + ((16\sqrt{6}/5) - 11)n + (2\sqrt{2}/3) + (\sqrt{3}/2) - (18\sqrt{6}/5) + 7)}.
\end{aligned} \tag{7}$$

2.2.4. *The First Zagreb Index and First Zagreb Entropy of $Si_2C_3 - I[m, n]$.* By using Table 2, the first Zagreb index and entropy are

$$M_1(Si_2C_3 - I) = 90mn - 20m - 30n + 4,$$

$$\begin{aligned} E_{M_1}(Si_2C_3 - I) &= \log(90mn - 20m - 30n + 4) \\ &- \frac{\log[(1) \times (27)]}{(90mn - 20m - 30n + 4)} \\ &- \frac{\log[(1) \times (256)]}{(90mn - 20m - 30n + 4)} \\ &- \frac{\log[(m + 2n) \times (3125)]}{(90mn - 20m - 30n + 4)} \\ &- \frac{\log[(15mn - 9m - 13n + 7) \times (46656)]}{(90mn - 20m - 30n + 4)}. \end{aligned} \quad (8)$$

2.2.5. *The Second Zagreb Index and Second Zagreb Entropy of $Si_2C_3 - I[m, n]$.* By using Table 2, the second Zagreb index and second Zagreb entropy are

$$M_2(Si_2C_3 - I) = 135mn - 9m - 61n + 14,$$

$$\begin{aligned} E_{M_2}(Si_2C_3 - I) &= \log(135mn - 9m - 61n + 14) \\ &- \frac{\log[(1) \times (4)]}{(135mn - 9m - 61n + 14)} \\ &- \frac{\log[(1) \times (27)]}{(135mn - 9m - 61n + 14)} \\ &- \frac{\log[(m + 2n) \times (256)]}{(135mn - 9m - 61n + 14)} \\ &- \frac{\log[(6m + 8n - 9) \times (46656)]}{(135mn - 9m - 61n + 14)} \\ &- \frac{\log[(15mn - 9m - 13n + 7) \times (9^9)]}{(135mn - 9m - 61n + 14)}. \end{aligned} \quad (9)$$

2.2.6. *The Hyper-Zagreb Index and Hyper-Zagreb Entropy of $Si_2C_3 - I[m, n]$.* By using Table 2, the hyper-Zagreb index and hyper-Zagreb entropy are

$$HM(Si_2C_3 - I) = 540mn - 158m - 236n + 412,$$

$$E_{HM}(Si_2C_3 - I) = \log(540mn - 158m - 236n + 412)$$

$$\begin{aligned} &- \frac{\log[(9)^{(9)}]}{(540mn - 158m - 236n + 412)} \\ &- \frac{\log[(16)^{(16)}]}{(540mn - 158m - 236n + 412)} \\ &- \frac{\log[(m + 2n) \times (16)^{(16)}]}{(540mn - 158m - 236n + 412)} \\ &- \frac{\log[(6m + 8n - 9) \times (25)^{(25)}]}{(540mn - 158m - 236n + 412)} \\ &- \frac{\log[(15mn - 9m - 13n + 7) \times (36)^{(36)}]}{(540mn - 158m - 236n + 412)}. \end{aligned} \quad (10)$$

2.2.7. *The Forgotten Index and Forgotten Entropy for $Si_2C_3 - I[m, n]$.* By using Table 2, the forgotten index and forgotten entropy are

$$F(Si_2C_3 - I) = 270mn - 76m - 114n + 24,$$

$$E_F(Si_2C_3 - I) = \log(270mn - 76m - 114n + 24)$$

$$\begin{aligned} &- \frac{\log[(5)^{(5)}]}{(270mn - 76m - 114n + 24)} \\ &- \frac{\log[(10)^{(10)}]}{(270mn - 76m - 114n + 24)} \\ &- \frac{\log[(m + 2n) \times (8)^{(8)}]}{(270mn - 76m - 114n + 24)} \\ &- \frac{\log[(6m + 8n - 9) \times (13)^{(13)}]}{(270mn - 76m - 114n + 24)} \\ &- \frac{\log[(15mn - 9m - 13n + 7) \times (18)^{(18)}]}{(270mn - 76m - 114n + 24)}. \end{aligned} \quad (11)$$

2.2.8. *The Augmented Zagreb Index and Augmented Zagreb Entropy of $Si_2C_3 - I[m, n]$.* By using Table 2, the AZI index and AZI entropy are $AZI(Si_2C_3 - I) = (10935/64)mn - (3481/64)m - (4357/64)n + (1223/64)$

$$E_{AZI}(Si_2C_3 - I) = \log\left(\frac{10935}{64}mn - \frac{3481}{64}m - \frac{4357}{64}n + \frac{1223}{64}\right)$$

$$\begin{aligned}
& - \frac{\log[(8)^{(8)}]}{((10935/64)mn - (3481/64)m - (4357/64)n + (1223/64))} - \frac{\log[(27/8)^{(27/8)}]}{((10935/64)mn - (3481/64)m - (4357/64)n + (1223/64))} \\
& - \frac{\log[(m+2n) \times (8)^{(8)}]}{((10935/64)mn - (3481/64)m - (4357/64)n + (1223/64))} - \frac{\log[(15mn - 9m - 13n + 7) \times [(9^3/4^3)]^{[(9^3/4^3)}]}{((10935/64)mn - (3481/64)m - (4357/64)n + (1223/64))}.
\end{aligned} \tag{12}$$

2.2.9. *The Balaban Index and Balaban Entropy for $Si_2C_3 - I[m, n]$.* By using Table 2, the Balaban index and Balaban entropy are

$$\begin{aligned}
J(Si_2C_3 - I) &= \frac{15mn - 2m - 3n}{5mn - 2m - 3n + 2} \left[\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{3}} + \frac{1}{2} (m + 2n) + \frac{1}{\sqrt{6}} (6m + 8n - 9) + \frac{1}{3} (15mn - 9m - 13n + 7) \right], \\
ENT_J(Si_2C_3 - I) &= \log(J(G)) - \frac{[q/(\sqrt{2}(q-p+2))]\log[q/(\sqrt{2}(q-p+2))]}{(J(G))} - \frac{[q/(\sqrt{3}(q-p+2))]\log[q/(\sqrt{3}(q-p+2))]}{(J(G))} \\
& - \frac{[q/(2(q-p+2))]\log[(m+2n) \times [q/(2(q-p+2))]]}{(J(G))} \\
& - \frac{[q/(\sqrt{6}(q-p+2))]\log[q(6m+8n-9)/(\sqrt{6}(q-p+2))]}{(J(G))} \\
& - \frac{[q/3(q-p+2)]\log[(15mn-9m-13n+7) \times (q/3(q-p+2))]}{(J(G))}.
\end{aligned} \tag{13}$$

2.2.10. *The Redefined First Zagreb Index and Redefined First Zagreb Entropy for $Si_2C_3 - I[m, n]$.* By using Table 2, the

redefined first Zagreb index and redefined first Zagreb entropy are $ReZG_1(Si_2C_3 - I) = 10mn$ and

$$\begin{aligned}
E_{ReZG_1}(Si_2C_3 - I) &= \log(10mn) - \frac{\log[(3/2)^{(3/2)}]}{(10mn)} - \frac{\log[(4/3)^{(4/3)}]}{(10mn)} - \frac{\log[m+2n]}{(10mn)} \\
& - \frac{\log[(6m+8n-9) \times (5/6)^{(5/6)}]}{(10mn)} - \frac{\log[(15mn-9m-13n+7) \times (2/3)^{(2/3)}]}{(10mn)}.
\end{aligned} \tag{14}$$

2.2.11. *The Redefined Second Zagreb Index and Redefined Second Zagreb Entropy for $Si_2C_3 - I[m, n]$.* By using Table 2, the redefined second Zagreb index and redefined second

Zagreb entropy are $ReZG_2(Si_2C_3 - I) = (45/2)mn - (53/10)m - (79/10)n + (67/60)$ and

$$\begin{aligned}
E_{ReZG_2}(Si_2C_3 - I) &= \log\left(\frac{45}{2}mn - \frac{53}{10}m - \frac{79}{10}n + \frac{67}{60}\right) - \frac{\log[(2/3)^{(2/3)}]}{((45/2)mn - (53/10)m - (79/10)n + (67/60))} \\
& - \frac{\log[(3/4)^{(3/4)}]}{((45/2)mn - (53/10)m - (79/10)n + (67/60))}
\end{aligned}$$

$$\begin{aligned}
& - \frac{\log[m+2n]}{((45/2)mn - (53/10)m - (79/10)n + (67/60))} - \frac{\log[(6/5)^{(6/5)}(6m+8n-9)]}{((45/2)mn - (53/10)m - (79/10)n + (67/60))} \\
& - \frac{\log[(3/2)^{(3/2)}(15mn-9m-13n+7)]}{((45/2)mn - (53/10)m - (79/10)n + (67/60))}.
\end{aligned} \tag{15}$$

2.2.12. *The Redefined Third Zagreb Index and Redefined Third Zagreb Entropy for $Si_2C_3 - I[m, n]$.* By using Table 2, the redefined third Zagreb index and redefined third Zagreb

entropy are $ReZG_3(Si_2C_3 - I) = 810mn - 290m - 430n + 126$ and

$$\begin{aligned}
E_{ReZG_3}(Si_2C_3 - I) &= \log(810mn - 290m - 430n + 126) - \frac{\log[(1 \times (6)^{(6)})]}{(810mn - 290m - 430n + 126)} \\
& - \frac{\log[(1 \times (12)^{(12)})]}{(810mn - 290m - 430n + 126)} - \frac{\log[(m+2n) \times (16)^{(16)})]}{(810mn - 290m - 430n + 126)} \\
& - \frac{\log[(6m+8n-9) \times (30)^{(30)})]}{(810mn - 290m - 430n + 126)} - \frac{\log[(15mn-9m-13n+7) \times (54)^{(54)})]}{(810mn - 290m - 430n + 126)}.
\end{aligned} \tag{16}$$

2.2.13. *The Fourth ABC Index and Fourth ABC Entropy of $Si_2C_3 - I[m, n]$.* By using Table 3, the fourth ABC index and fourth ABC entropy are

$$\begin{aligned}
ABC_4(Si_2C_3 - I) &= \frac{20}{3}mn + \left[\frac{\sqrt{8}}{5} + 4 \times \sqrt{\left(\frac{11}{42}\right)} + 2 \times \sqrt{\left(\frac{11}{40}\right)} + 2 \frac{\sqrt{2}}{3} + \frac{\sqrt{14}}{8} + \sqrt{\left(\frac{5}{6}\right)} - \frac{56}{9} \right]m \\
& + \left[4 \frac{\sqrt{2}}{5} + 2 \sqrt{\left(\frac{2}{7}\right)} + 2 \sqrt{\left(\frac{11}{42}\right)} + \sqrt{\left(\frac{11}{10}\right)} + \frac{7}{2\sqrt{2}} + \frac{2\sqrt{2}}{3} + \frac{\sqrt{14}}{4} + 2 \sqrt{\left(\frac{5}{6}\right)} - \frac{25}{3} \right]n \\
& + \frac{1}{\sqrt{2}} + \sqrt{\left(\frac{2}{5}\right)} + \frac{\sqrt{8}}{5} + \frac{3}{2\sqrt{7}} + 2 \sqrt{\left(\frac{2}{7}\right)} + \sqrt{\left(\frac{3}{10}\right)} - 7 \sqrt{\left(\frac{11}{42}\right)} - 5 \sqrt{\left(\frac{11}{40}\right)} \\
& + \sqrt{\left(\frac{13}{56}\right)} - \sqrt{\left(\frac{7}{2}\right)} - \sqrt{2} - \frac{7}{2} \sqrt{\left(\frac{13}{56}\right)} + \frac{71}{9}, \\
ENT_{ABC_4}(G) &= \log(ABC_4) - \frac{1}{(ABC_4)} \log \left[\left(\frac{1}{\sqrt{2}} \right)^{(1/\sqrt{2})} \right] - \frac{1}{(ABC_4)} \log \left[\left(\sqrt{\frac{2}{5}} \right)^{(\sqrt{(2/5)})} \right] - \frac{1}{(ABC_4)} \log \left[\left(\frac{3}{2\sqrt{7}} \right)^{(3/2\sqrt{7})} \right] \\
& - \frac{1}{(ABC_4)} \log \left[(m+2n+1) \times \left(\frac{\sqrt{8}}{5} \right)^{(\sqrt{8}/5)} \right] - \frac{1}{(ABC_4)} \log \left[(2n+2) \times \left(\sqrt{\frac{2}{7}} \right)^{(\sqrt{(2/7)})} \right] \\
& - \frac{1}{(ABC_4)} \log \left[\left(\sqrt{\frac{3}{10}} \right)^{(\sqrt{(3/10)})} \right] - \frac{1}{(ABC_4)} \log \left[(4m+2n-7) \times \left(\sqrt{\frac{11}{42}} \right)^{(\sqrt{(11/42)})} \right] \\
& - \frac{1}{(ABC_4)} \log \left[(2n-2) \times \left(\frac{1}{2} \right)^{(1/2)} \right] - \frac{1}{(ABC_4)} \log \left[(2m+2n-5) \times \left(\sqrt{\frac{11}{40}} \right)^{(\sqrt{(11/40)})} \right]
\end{aligned}$$

$$\begin{aligned}
& -\frac{1}{(ABC_4)} \log \left[\left(\sqrt{\frac{13}{56}} \right)^{(\sqrt{13/56})} \right] - \frac{1}{(ABC_4)} \log \left[(m+2n-4) \times \left(\frac{\sqrt{14}}{8} \right)^{(\sqrt{14}/8)} \right] \\
& -\frac{1}{(ABC_4)} \log \left[(2m+2n-3) \times \left(\frac{\sqrt{2}}{3} \right)^{(\sqrt{2}/3)} \right] - \frac{1}{(ABC_4)} \log \left[(2m+4n-7) \times \left(\frac{\sqrt{5}}{2\sqrt{6}} \right)^{(\sqrt{5}/2\sqrt{6})} \right] \\
& -\frac{1}{(ABC_4)} \log \left[(15mn-14m-21n+20) \times \left(\frac{4}{9} \right)^{(4/9)} \right].
\end{aligned} \tag{17}$$

2.2.14. *The Fifth GA Index and Fifth GA Entropy of $Si_2C_3 - I[m, n]$.* By using Table 3, the fifth GA index and fifth GA entropy are

$$\begin{aligned}
GA_5(G) &= 15mn + \left(\frac{8\sqrt{42}}{13} + \frac{8\sqrt{10}}{13} + \frac{3\sqrt{7}}{4} + \frac{24\sqrt{2}}{17} - 12 \right) m \\
&+ \left(-17 + \frac{\sqrt{35}}{3} + \frac{4\sqrt{42}}{13} + \frac{8\sqrt{3}}{7} + \frac{8\sqrt{10}}{13} + \frac{3\sqrt{7}}{4} + \frac{24\sqrt{8}}{17} \right) n \\
&+ 17 - \frac{218\sqrt{2}}{51} + \frac{\sqrt{15}}{4} - \frac{67\sqrt{7}}{88} + \frac{\sqrt{35}}{3} + \frac{2\sqrt{30}}{11} - \frac{14\sqrt{42}}{13} - \frac{8\sqrt{3}}{7} - \frac{20\sqrt{10}}{13} + \frac{4\sqrt{14}}{15}, \\
E_{GA_5}(G) &= \log(GA_5) - \frac{1}{(GA_5)} \log \left[\left(\frac{2\sqrt{2}}{3} \right)^{(2\sqrt{2}/3)} \right] - \frac{1}{(GA_5)} \log \left\{ \left(\frac{\sqrt{15}}{4} \right)^{(\sqrt{15}/4)} - \frac{1}{(GA_5)} \log[m+2n+1] \right. \\
&- \frac{1}{(GA_5)} \log \left[\left(\frac{4\sqrt{7}}{11} \right)^{(4\sqrt{7}/11)} \right] - \frac{1}{(GA_5)} \log \left[(2n+2) \times \left(\frac{\sqrt{35}}{6} \right)^{(\sqrt{35}/6)} \right] - \frac{1}{(GA_5)} \log \left[\left(\frac{2\sqrt{30}}{11} \right)^{(2\sqrt{30}/11)} \right] \\
&- \frac{1}{(GA_5)} \log \left[(4m+2n-7) \times \left(\frac{2\sqrt{42}}{13} \right)^{(2\sqrt{42}/13)} \right] - \frac{1}{(GA_5)} \log \left[(2n-2) \times \left(\frac{4\sqrt{3}}{7} \right)^{(4\sqrt{3}/7)} \right] \\
&- \frac{1}{(GA_5)} \log \left[(2m+2n-5) \times \left(\frac{4\sqrt{10}}{13} \right)^{(4\sqrt{10}/13)} \right] - \frac{1}{(GA_5)} \log \left[\left(\frac{4\sqrt{14}}{15} \right)^{(4\sqrt{14}/15)} \right] - \frac{1}{(GA_5)} \log[m+2n-4] \\
&- \frac{1}{(GA_5)} \log \left[(2m+2n-3) \times \left(\frac{3\sqrt{7}}{8} \right)^{(3\sqrt{7}/8)} \right] - \frac{1}{(GA_5)} \log \left[(2m+4n-7) \times \left(\frac{6\sqrt{8}}{17} \right)^{(6\sqrt{8}/17)} \right] \\
&- \frac{1}{(GA_5)} \log[(15mn-14m-21n+20)].
\end{aligned} \tag{18}$$

3. Crystallographic Structure of $Si_2C_3 - II[m, n]$

The framework of $Si_2C_3 - II$ sheet contains only hexagonal rings. This framework is greater in energy than that of $Si_2C_3 - I$ sheet. On the other hand, the composition of $Si_2C_3 - II$ is quite different from $Si_2C_3 - I$ sheet as Si-Si bonds can be viewed and the ratio of Si atoms making Si dimers is half. Also, $Si_2C_3 - II$ is more unstable than $Si_2C_3 - I$. The anticipated minimal energy frameworks $Si_2C_3 - I$ and $Si_2C_3 - II$ sheets have exceptional semi-conducting axioms that could be employed for mono-electronic utilization. The mechanic strength of the silicon carbide sheets is also significant. It is widely known that

graphene carries magnificent elastic properties having immense elastic constants. Former analyses have demonstrated that silicon carbide also holds well elastic axioms.

In Figure 3 [27, 28], m denotes the total associated unit cells in each row while n shows the total sum of associated rows with m number of cells. Figure 4 illustrates the way in which cells are associated in a row and the way of association of rows with each other. Also, $|V(Si_2C_3 - II)| = 10mn$ and $|E(Si_2C_3 - II)| = 3(5mn - n - m)$

3.1. *Methodology of Silicon Carbide $Si_2C_3 - II[m, n]$ Formulas.* For silicon carbide $Si_2C_3 - II[m, n]$, we join one unit cell with another unit cell and then continue this

FIGURE 3: (a) Unit cell of $\text{Si}_2\text{C}_3 - \text{II}[m, n]$; (b) $\text{Si}_2\text{C}_3 - \text{II}[3, 3]$. FIGURE 4: (a) $\text{Si}_2\text{C}_3 - \text{II}[5, 1]$; (b) $\text{Si}_2\text{C}_3 - \text{II}[5, 2]$.TABLE 4: Vertex partition of $\text{Si}_2\text{C}_3 - \text{II}[m, n]$ established on degrees of each vertex.

$\tau(m)$	No. of repetitions	Kinds of vertices
1	3	M_{V_1}
2	$6m + 6n - 6$	M_{V_2}
3	$10mn - 6m - 6n + 3$	M_{V_3}

TABLE 5: Edge partition of $\text{Si}_2\text{C}_3 - \text{II}[m, n]$ established on degrees of end vertices.

$(\tau(r), \tau(s))$	No. of repetitions	Kinds of edges
(2, 1)	2	M_{E_1}
(3, 1)	1	M_{E_2}
(2, 2)	$2m + 2n$	M_{E_3}
(3, 2)	$8m + 8n - 14$	M_{E_4}
(3, 3)	$15mn - 13m - 13n + 11$	M_{E_5}

TABLE 6: Edge partition of $\text{Si}_2\text{C}_3 - \text{II}[m, n]$, $m, n, s \geq 2$.

(S_s, S_t)	Frequency
(3, 2)	2
(7, 3)	1
(4, 3)	2
(5, 4)	2
(5, 5)	$-4 + 2(m + n)$
(7, 5)	$2(m + n)$
(7, 6)	$-2 + 2(m + n)$
(8, 6)	$-6 + 2(m + n)$
(8, 5)	$-6 + (m + n)$
(8, 7)	2
(8, 8)	$-8 + 2(m + n)$
(7, 7)	2
(9, 7)	$-3 + 2(m + n)$
(9, 8)	$-5 + 2(m + n)$
(9, 9)	$23 - 19n - 19m + 15mn$

process horizontally till n unit cells. Similar technique will be applied for vertical direction. As a result, we will obtain the $\text{Si}_2\text{C}_3 - \text{II}[m, n]$ sheet; see Figure 3. Moreover, Tables 4 and 5 are used for computation of vertices and edges, respectively.

The edge partition of $\text{Si}_2\text{C}_3 - \text{II}[m, n]$ established on the addition of degree of terminal vertices of every edge is illustrated in Table 6.

3.2. Computation of Entropies for Crystallographic Structure of $\text{Si}_2\text{C}_3 - \text{II}[m, n]$. This portion deals with the computation of topological indices and their corresponding graph entropies for the crystallographic structure of $\text{Si}_2\text{C}_3 - \text{II}[m, n]$.

3.2.1. The Randić Index and Randić Entropy for $\text{Si}_2\text{C}_3 - \text{II}[m, n]$. For $\alpha = 1$, the Randić index and Randić entropy by Table 5 are

$$\begin{aligned}
 R_1(\text{Si}_2\text{C}_3 - \text{II}) &= 135mn - 61m - 61n + 22, \\
 E_{R_1}(\text{Si}_2\text{C}_3 - \text{II}) &= \log[135mn - 61m - 61n + 22] - \frac{\log[(2) \times (2)^{(2)}]}{[135mn - 61m - 61n + 22]} - \frac{\log[(1) \times (3)^{(3)}]}{[135mn - 61m - 61n + 22]} \\
 &\quad - \frac{\log[(2m + 2n) \times (4)^{(4)}]}{[135mn - 61m - 61n + 22]} - \frac{\log[(8m + 8n - 14) \times (6)^{(6)}]}{[135mn - 61m - 61n + 22]} - \frac{\log[(15mn - 13m - 13n + 11) \times (9)^{(9)}]}{[135mn - 61m - 61n + 22]}.
 \end{aligned} \tag{19}$$

For $\alpha = -1$, by using Table 5, the Randić index and Randić entropy are $R_{-1}(\text{Si}_2\text{C}_3 - II) = (5/3)mn + (7/18)m + (7/18)n + (2/9)$ and

$$\begin{aligned} E_{R_{-1}}(\text{Si}_2\text{C}_3 - II) = & \log\left(\frac{5}{3}mn + \frac{7}{18}m + \frac{7}{18}n + \frac{2}{9}\right) - \frac{\log\left[(2) \times (2)^{(-1/2)}\right]}{((5/3)mn + (7/18)m + (7/18)n + (2/9))} \\ & - \frac{\log\left[(1) \times (3)^{(-1/3)}\right]}{((5/3)mn + (7/18)m + (7/18)n + (2/9))} - \frac{\log\left[(2m + 2n) \times (4)^{(-1/4)}\right]}{((5/3)mn + (7/18)m + (7/18)n + (2/9))} \\ & - \frac{\log\left[(8m + 8n - 14) \times (6)^{(-1/6)}\right]}{((5/3)mn + (7/18)m + (7/18)n + (2/9))} - \frac{\log\left[(15mn - 13m - 13n + 11) \times (9)^{(-1/9)}\right]}{((5/3)mn + (7/18)m + (7/18)n + (2/9))}. \end{aligned} \quad (20)$$

For $\alpha = 1/2$, by using Table 2, the Randić index and Randić entropy are $R_{1/2}(\text{Si}_2\text{C}_3 - I) = 45mn + (8\sqrt{6} - 35)(m + n) + 2\sqrt{2} + \sqrt{3} - 14\sqrt{6} + 33$ and

$$\begin{aligned} E_{R_{1/2}}(\text{Si}_2\text{C}_3 - II) = & \log(45mn + (8\sqrt{6} - 35)(m + n) + 2\sqrt{2} + \sqrt{3} - 14\sqrt{6} + 33) \\ & - \frac{\log\left[(2) \times (2)^{(\sqrt{2}/2)}\right]}{(45mn + (8\sqrt{6} - 35)(m + n) + 2\sqrt{2} + \sqrt{3} - 14\sqrt{6} + 33)} \\ & - \frac{\log\left[(1) \times (3)^{(\sqrt{3}/2)}\right]}{(45mn + (8\sqrt{6} - 35)(m + n) + 2\sqrt{2} + \sqrt{3} - 14\sqrt{6} + 33)} \\ & - \frac{\log\left[(2m + 2n) \times (4)^{(\sqrt{4}/2)}\right]}{(45mn + (8\sqrt{6} - 35)(m + n) + 2\sqrt{2} + \sqrt{3} - 14\sqrt{6} + 33)} \\ & - \frac{\log\left[(8m + 8n - 14) \times (6)^{(\sqrt{6}/2)}\right]}{(45mn + (8\sqrt{6} - 35)(m + n) + 2\sqrt{2} + \sqrt{3} - 14\sqrt{6} + 33)} \\ & - \frac{\log\left[(15mn - 13m - 13n + 11) \times (9)^{(\sqrt{9}/2)}\right]}{(45mn + (8\sqrt{6} - 35)(m + n) + 2\sqrt{2} + \sqrt{3} - 14\sqrt{6} + 33)}. \end{aligned} \quad (21)$$

For $\alpha = -1/2$, by using Table 2, the Randić index and Randić entropy are

$$\begin{aligned} R_{-1/2}(\text{Si}_2\text{C}_3 - II) = & 5mn + ((8/\sqrt{6}) - (10/3))(m + n) + \sqrt{2} + (1/\sqrt{3}) - (14/\sqrt{6}) + (11/3), \\ E_{R_{(-1/2)}}(\text{Si}_2\text{C}_3 - II) = & \log\left(5mn + \left(\frac{8}{\sqrt{6}} - \frac{10}{3}\right)(m + n) + \sqrt{2} + \frac{1}{\sqrt{3}} - \frac{14}{\sqrt{6}} + \frac{11}{3}\right) \\ & - \frac{\log\left[(2) \times (2)^{(-1/2\sqrt{2})}\right]}{(5mn + ((8/\sqrt{6}) - (10/3))(m + n) + \sqrt{2} + (1/\sqrt{3}) - (14/\sqrt{6}) + (11/3))} \end{aligned}$$

$$\begin{aligned}
& \frac{\log \left[(1) \times (3)^{(-1/2\sqrt{3})} \right]}{(5mn + ((8/\sqrt{6}) - (10/3))(m+n) + \sqrt{2} + (1/\sqrt{3}) - (14/\sqrt{6}) + (11/3))} \\
& \frac{\log \left[(2m+2n) \times (4)^{(-1/2\sqrt{4})} \right]}{(5mn + ((8/\sqrt{6}) - (10/3))(m+n) + \sqrt{2} + (1/\sqrt{3}) - (14/\sqrt{6}) + (11/3))} \\
& \frac{\log \left[(8m+8n-14) \times (6)^{(-1/2\sqrt{6})} \right]}{(5mn + ((8/\sqrt{6}) - (10/3))(m+n) + \sqrt{2} + (1/\sqrt{3}) - (14/\sqrt{6}) + (11/3))} \\
& \frac{\log \left[(15mn-13m-13n+11) \times (9)^{(-1/2\sqrt{9})} \right]}{(5mn + ((8/\sqrt{6}) - (10/3))(m+n) + \sqrt{2} + (1/\sqrt{3}) - (14/\sqrt{6}) + (11/3))}. \tag{22}
\end{aligned}$$

3.2.2. The ABC Index and ABC Entropy of $\text{Si}_2\text{C}_3 - II[m, n]$.

By using Table 5, the ABC index and ABC entropy are

$$\begin{aligned}
ABC(\text{Si}_2\text{C}_3 - II) &= 10mn + ((10/\sqrt{2}) - (26/3))(m+n) - (12/\sqrt{2}) + \sqrt{(2/3)} + (22/3), \\
E_{ABC}(\text{Si}_2\text{C}_3 - II) &= \log(ABC(\text{Si}_2\text{C}_3 - II)) - \frac{\log \left[(2) \times (1/\sqrt{2})^{(1/\sqrt{2})} \right]}{(ABC(\text{Si}_2\text{C}_3 - II))} - \frac{\log \left[(15mn-13m-13n+11) \times (2/3)^{(2/3)} \right]}{(ABC(\text{Si}_2\text{C}_3 - II))} \\
&\quad - \frac{\log \left[(2m+2n) \times (1/\sqrt{2})^{(1/\sqrt{2})} \right]}{(ABC(\text{Si}_2\text{C}_3 - II))} - \frac{\log \left[(8m+8n-14) \times (1/\sqrt{2})^{(1/\sqrt{2})} \right]}{(ABC(\text{Si}_2\text{C}_3 - II))} - \frac{\log \left[(1) \times (\sqrt{(2/3)})^{\sqrt{(2/3)}} \right]}{(ABC(\text{Si}_2\text{C}_3 - II))}. \tag{23}
\end{aligned}$$

3.2.3. The GA Index and GA Entropy of $\text{Si}_2\text{C}_3 - II[m, n]$.

By using Table 5, the GA index and GA entropy are

$$\begin{aligned}
GA(\text{Si}_2\text{C}_3 - II) &= 15mn + ((16\sqrt{6}/5) - 11)(m+n) + (4\sqrt{2}/3) + (\sqrt{3}/2) - (28\sqrt{6}/5) + 11 \\
E_{GA}(\text{Si}_2\text{C}_3 - II) &= \log(GA(\text{Si}_2\text{C}_3 - II)) - \frac{\log \left[(2) \times [2\sqrt{2}/3]^{[2\sqrt{2}/3]} \right]}{(GA(\text{Si}_2\text{C}_3 - II))} - \frac{\log \left[[\sqrt{3}/2]^{[\sqrt{3}/2]} \right]}{(GA(\text{Si}_2\text{C}_3 - II))} - \frac{\log[2m+2n]}{(GA(\text{Si}_2\text{C}_3 - II))} \\
&\quad - \frac{\log[(15mn-13m-13n+11)]}{(GA(\text{Si}_2\text{C}_3 - II))}. \tag{24}
\end{aligned}$$

3.2.4. The First Zagreb Index and First Zagreb Entropy of $\text{Si}_2\text{C}_3 - II[m, n]$. By using Table 5, the first Zagreb index

and entropy are $M_1(\text{Si}_2\text{C}_3 - II) = 90mn - 30m - 30n + 6$ and

$$\begin{aligned}
E_{M_1}(\text{Si}_2\text{C}_3 - II) &= \log(90mn - 30m - 30n + 6) - \frac{\log[54]}{(90mn - 30m - 30n + 6)} - \frac{\log[256]}{(90mn - 30m - 30n + 6)} \\
&\quad - \frac{\log[256(2m+2n)]}{(90mn - 30m - 30n + 6)} - \frac{\log[3125(8m+8n-14)]}{(90mn - 30m - 30n + 6)} - \frac{\log[46656(15mn-13m-13n+11)]}{(90mn - 30m - 30n + 6)}. \tag{25}
\end{aligned}$$

3.2.5. The Second Zagreb Index and Second Zagreb Entropy of $\text{Si}_2\text{C}_3 - II[m, n]$. By using Table 3, the second Zagreb index

and second Zagreb entropy are $M_2(\text{Si}_2\text{C}_3 - II) = 135mn - 61m - 61n + 22$ and

$$\begin{aligned}
E_{M_2}(\text{Si}_2\text{C}_3 - II) &= \log(135mn - 61m - 61n + 22) - \frac{\log[8]}{(135mn - 61m - 61n + 22)} - \frac{\log[27]}{(135mn - 61m - 61n + 22)} \\
&\quad - \frac{\log[(2m + 2n) \times (4)^{(4)}]}{(135mn - 61m - 61n + 22)} - \frac{\log[(8m + 8n - 14) \times (5)^{(5)}]}{(135mn - 61m - 61n + 22)} - \frac{\log[(15mn - 13m - 13n + 11) \times (9)^{(9)}]}{(135mn - 61m - 61n + 22)}.
\end{aligned} \tag{26}$$

3.2.6. *The Hyper-Zagreb Index and Hyper-Zagreb Entropy of $\text{Si}_2\text{C}_3 - II[m, n]$.* By using Table 5, the hyper-Zagreb index and hyper-Zagreb entropy are

$$\text{HM}(\text{Si}_2\text{C}_3 - II) = 540mn - 236(m + n) + 71,$$

$$\begin{aligned}
E_{\text{HM}}(\text{Si}_2\text{C}_3 - II) &= \log(540mn - 236(m + n) + 71) - \frac{\log[(2) \times (9)^{(9)}]}{(540mn - 236(m + n) + 71)} - \frac{\log[(m + 8n - 14) \times (25)^{(25)}]}{(540mn - 236(m + n) + 71)} \\
&\quad - \frac{\log[(2m + 2n) \times 16^{16}]}{(540mn - 236(m + n) + 71)} - \frac{\log[16^{16}]}{(540mn - 236(m + n) + 71)} - \frac{\log[36^{36}(15mn - 13m - 13n + 11)]}{(540mn - 236(m + n) + 71)}.
\end{aligned} \tag{27}$$

3.2.7. *The Forgotten Index and Forgotten Entropy for $\text{Si}_2\text{C}_3 - II[m, n]$.* By using Table 5, the forgotten index and forgotten entropy are

$$F(\text{Si}_2\text{C}_3 - II) = 270mn - 114(m + n) + 36,$$

$$\begin{aligned}
E_F(\text{Si}_2\text{C}_3 - II) &= \log(270mn - 114(m + n) + 36) - \frac{\log[(2) \times (5)^{(5)}]}{(270mn - 114(m + n) + 36)} \\
&\quad - \frac{\log[10^{10}]}{(270mn - 114(m + n) + 36)} - \frac{\log[(2m + 2n) \times 8^8]}{(270mn - 114(m + n) + 36)} \\
&\quad - \frac{\log[(8m + 8n - 14) \times 13^{13}]}{(270mn - 114(m + n) + 36)} - \frac{\log[(15mn - 13m - 13n + 11) \times 18^{18}]}{(270mn - 114(m + n) + 36)}.
\end{aligned} \tag{28}$$

3.2.8. *The Augmented Zagreb Index and Augmented Zagreb Entropy of $\text{Si}_2\text{C}_3 - II[m, n]$.* By using Table 5, it is easy to see

that the augmented Zagreb index and augmented Zagreb entropy are

$$\text{AZI}(\text{Si}_2\text{C}_3 - II) = (10935/64)mn - (4357/64)m - (4357/64)n + (2091/64),$$

$$\begin{aligned}
E_{\text{AZI}}(\text{Si}_2\text{C}_3 - II) &= \log\left(\frac{10935}{64}mn - \frac{4357}{64}m - \frac{4357}{64}n + \frac{2091}{64}\right) - \frac{\log[(2) \times (8)^{(8)}]}{((10935/64)mn - (4357/64)m - (4357/64)n + (2091/64))} \\
&\quad - \frac{\log[(1) \times [27/8]^{[27/8]}]}{((10935/64)mn - (4357/64)m - (4357/64)n + (2091/64))} \\
&\quad - \frac{\log[(2m + 2n) \times (8)^{(8)}]}{((10935/64)mn - (4357/64)m - (4357/64)n + (2091/64))}
\end{aligned}$$

$$-\frac{\log[(8m+8n-14) \times (8)^{(8)}]}{((10935/64)mn - (4357/64)m - (4357/64)n + (2091/64))} - \frac{\log[(15mn - 13m - 13n + 11) \times (9^3/4^3)^{(9^3/4^3)}]}{((10935/64)mn - (4357/64)m - (4357/64)n + (2091/64))}. \quad (29)$$

3.2.9. *The Balaban Index and Balaban Entropy for $\text{Si}_2\text{C}_3 - II[m, n]$.* By using Table 2, it is easy to see that the Balaban index and Balaban entropy are

$$J(\text{Si}_2\text{C}_3 - II) = \frac{15mn - 3(m+n)}{5mn - 3(m+n) + 2} \left[\sqrt{2} + \frac{1}{\sqrt{3}} + (m+n) + \frac{1}{\sqrt{6}} (8m+8n-14) + \frac{1}{3} (15mn - 13m - 13n + 11) \right],$$

$$E_J(\text{Si}_2\text{C}_3 - II) = \log(J(\text{Si}_2\text{C}_3 - II)) - \frac{\log[(2) \times [q/\sqrt{2} (q-p+2)]^{[q/\sqrt{2} (q-p+2)]}]}{(J(\text{Si}_2\text{C}_3 - II))} - \frac{\log[(1) \times [q/\sqrt{3} (q-p+2)]^{[q/\sqrt{3} (q-p+2)]}]}{(J(\text{Si}_2\text{C}_3 - II))}$$

$$- \frac{\log[(2m+2n) \times [q/2 (q-p+2)]^{[q/2 (q-p+2)]}]}{(J(\text{Si}_2\text{C}_3 - II))} - \frac{\log[(8m+8n-14) \times [q/\sqrt{6} (q-p+2)]^{[q/\sqrt{6} (q-p+2)]}]}{(J(\text{Si}_2\text{C}_3 - II))}$$

$$- \frac{\log[(15mn - 13m - 13n + 11) \times [q/3 (q-p+2)]^{[q/3 (q-p+2)]}]}{(J(\text{Si}_2\text{C}_3 - II))}. \quad (30)$$

3.2.10. *The Redefined First Zagreb Index and Redefined First Zagreb Entropy for $\text{Si}_2\text{C}_3 - II[m, n]$.* By using Table 5, the

redefined first Zagreb index and redefined first Zagreb entropy are $\text{ReZG}_1(\text{Si}_2\text{C}_3 - II) = 10mn$ and

$$\text{ENT}_{\text{ReZG}_1}(\text{Si}_2\text{C}_3 - II) = \log(10mn) - \frac{\log[(2) \times (3/2)^{(3/2)}]}{(10mn)} - \frac{\log[(4/3)^{(4/3)}]}{(10mn)} - \frac{\log[2m+2n]}{(10mn)}$$

$$- \frac{\log[(8m+8n-14) \times (5/6)^{(5/6)}]}{(10mn)} - \frac{\log[(15mn - 13m - 13n + 11) \times (2/3)^{(2/3)}]}{(10mn)}. \quad (31)$$

3.2.11. *The Redefined Second Zagreb Index and Redefined Second Zagreb Entropy for $\text{Si}_2\text{C}_3 - II[m, n]$.* By using Table 5, the redefined second Zagreb index and redefined

second Zagreb entropy are $\text{ReZG}_2(\text{Si}_2\text{C}_3 - II) = (45mn/3) - (79(m+n)/10) + (107/60)$ and

$$E_{\text{ReZG}_2}(\text{Si}_2\text{C}_3 - II) = \log\left(\frac{45}{3}mn - \frac{79}{10}m - \frac{79}{10}n + \frac{107}{60}\right) - \frac{\log[(2) \times (2/3)^{(2/3)}]}{((45/3)mn - (79/10)m - (79/10)n + (107/60))}$$

$$- \frac{\log[(1) \times (3/4)^{(3/4)}]}{((45/3)mn - (79/10)m - (79/10)n + (107/60))} - \frac{\log[(2m+2n) \times (1)]}{((45/3)mn - (79/10)m - (79/10)n + (107/60))}$$

$$- \frac{\log[(8m+8n-14) \times (6/5)^{(6/5)}]}{((45/3)mn - (79/10)m - (79/10)n + (107/60))} - \frac{\log[(15mn - 13m - 13n + 11) \times (3/2)^{(3/2)}]}{((45/3)mn - (79/10)m - (79/10)n + (107/60))}. \quad (32)$$

3.2.12. *The Redefined Third Zagreb Index and Redefined Third Zagreb Entropy for $Si_2C_3 - II[m, n]$.* By using Table 5,

the redefined third Zagreb index and redefined third Zagreb entropy are

$$ReZG_3(Si_2C_3 - II) = 810mn - 430(m + n) + 198,$$

$$\begin{aligned} E_{ReZG_3}(Si_2C_3 - II) = \log(810mn - 430m - 430n + 198) &- \frac{\log[(2) \times (6)^{(6)}]}{(810mn - 430m - 430n + 198)} \\ &- \frac{\log[(1) \times (12)^{(12)}]}{(810mn - 430m - 430n + 198)} - \frac{\log[(2m + 2n) \times (16)^{(16)}]}{(810mn - 430m - 430n + 198)} \\ &- \frac{\log[(8m + 8n - 14) \times (30)^{(30)}]}{(810mn - 430m - 430n + 198)} - \frac{\log[(15mn - 13m - 13n + 11) \times (54)^{(54)}]}{(810mn - 430m - 430n + 198)}. \end{aligned} \quad (33)$$

3.2.13. *The Fourth ABC Index and Fourth ABC Entropy of $Si_2C_3 - II[m, n]$.* By using Table 6, the fourth ABC index and fourth ABC entropy are

$$\begin{aligned} ABC_4(Si_2C_3 - II) &= \frac{23mn}{3} + (m + n) \left[\frac{22\sqrt{2}}{15} + 2\left(\sqrt{\frac{2}{7}}\right) + 2\left(\sqrt{\frac{11}{42}}\right) + \left(\sqrt{\frac{11}{10}}\right) + \frac{\sqrt{14}}{4} + \frac{2\sqrt{2}}{3} + \left(\sqrt{\frac{5}{6}} - \frac{67}{9}\right) \right] \\ &+ 2\left(\sqrt{\frac{2}{21}}\right) + \left(\sqrt{\frac{5}{3}}\right) + 2\left(\sqrt{\frac{7}{5}}\right) - \frac{8\sqrt{2}}{5} - 2\left(\sqrt{\frac{11}{42}}\right) - 3\left(\sqrt{\frac{11}{10}}\right) + 2\left(\sqrt{\frac{13}{56}}\right) - \sqrt{14} + \frac{4\sqrt{3}}{7} \\ &- \frac{5}{2}\left(\sqrt{\frac{5}{6}}\right) + \frac{65}{9}, \\ ENT_{ABC_4}(G) &= \log(ABC_4) - \frac{1}{(ABC_4)} \log \left[(2) \times \left(\frac{1}{\sqrt{2}} \right)^{(1/\sqrt{2})} \right] - \frac{1}{(ABC_4)} \log \left[(2m + 2n - 4) \times \left(\frac{2\sqrt{2}}{5} \right)^{(2\sqrt{2}/5)} \right] \\ &- \frac{1}{(ABC_4)} \log \left[(2) \times \left(\frac{\sqrt{5}}{2\sqrt{3}} \right)^{(\sqrt{5}/2\sqrt{3})} \right] - \frac{1}{(ABC_4)} \log \left[(2) \times \left(\frac{\sqrt{7}}{2\sqrt{5}} \right)^{(\sqrt{7}/2\sqrt{5})} \right] - \frac{1}{(ABC_4)} \log \left[\left(\frac{2\sqrt{2}}{\sqrt{21}} \right)^{(2\sqrt{2}/\sqrt{21})} \right] \\ &- \frac{1}{(ABC_4)} \log \left[(2m + 2n) \times \left(\frac{\sqrt{2}}{\sqrt{7}} \right)^{(\sqrt{2}/\sqrt{7})} \right] - \frac{1}{(ABC_4)} \log \left[(2m + 2n - 2) \times \left(\frac{\sqrt{11}}{\sqrt{42}} \right)^{(\sqrt{11}/\sqrt{42})} \right] \\ &- \frac{1}{(ABC_4)} \log \left[(2m + 2n - 6) \times \left(\frac{1}{2} \right)^{(1/2)} \right] - \frac{1}{(ABC_4)} \log \left[(2m + 2n - 6) \times \left(\frac{\sqrt{11}}{\sqrt{40}} \right)^{(\sqrt{11}/\sqrt{40})} \right] \\ &- \frac{1}{(ABC_4)} \log \left[(2) \times \left(\frac{\sqrt{13}}{\sqrt{56}} \right)^{(\sqrt{13}/\sqrt{56})} \right] - \frac{1}{(ABC_4)} \log \left[(2m + 2n - 8) \times \left(\frac{\sqrt{14}}{8} \right)^{(\sqrt{14}/8)} \right] \\ &- \frac{1}{(ABC_4)} \log \left[(2) \times \left(\frac{2\sqrt{3}}{7} \right)^{(2\sqrt{3}/7)} \right] - \frac{1}{(ABC_4)} \log \left[(2m + 2n - 3) \times \left(\frac{\sqrt{2}}{3} \right)^{(\sqrt{2}/3)} \right] \\ &- \frac{1}{(ABC_4)} \log \left[\left[(2m + 2n - 5) \times \left(\frac{\sqrt{5}}{2\sqrt{6}} \right)^{(\sqrt{5}/2\sqrt{6})} \right] - \frac{1}{(ABC_4)} \log \left[(15mn - 19m - 19n + 23) \times \left(\frac{4}{9} \right)^{(4/9)} \right]. \end{aligned} \quad (34)$$

3.2.14. *The Fifth GA Index and Fifth GA Entropy of $Si_2C_3 - II[m, n]$.* By using Table 6, the fifth GA index and fifth GA entropy are

$$\begin{aligned}
 GA_5(G) &= 15mn + (m+n) \left[-15 + \frac{\sqrt{35}}{3} + \frac{4\sqrt{42}}{13} + \frac{8\sqrt{3}}{7} + \frac{8\sqrt{10}}{13} + \frac{3\sqrt{7}}{4} + \frac{24\sqrt{2}}{17} \right] + \frac{4\sqrt{6}}{5} \\
 &\quad + \frac{\sqrt{21}}{5} + \frac{8\sqrt{3}}{7} + \frac{8\sqrt{5}}{9} - \frac{4\sqrt{42}}{13} - \frac{24\sqrt{3}}{7} - \frac{24\sqrt{10}}{13} + \frac{8\sqrt{14}}{15} - \frac{9\sqrt{7}}{8} - \frac{60\sqrt{2}}{17} + 13, \\
 E_{GA_5}(G) &= \log(GA_5) - \frac{1}{(GA_5)} \log \left[(2) \times \left(\frac{2\sqrt{6}}{5} \right)^{(2\sqrt{6}/5)} \right] - \frac{1}{(GA_5)} \log \left[\left(\frac{\sqrt{21}}{5} \right)^{(\sqrt{21}/5)} \right] - \frac{1}{(GA_5)} \log \left[(2) \times \left(\frac{4\sqrt{3}}{7} \right)^{(4\sqrt{3}/7)} \right] \\
 &\quad - \frac{1}{(GA_5)} \log \left[(2) \times \left(\frac{4\sqrt{5}}{9} \right)^{(4\sqrt{5}/9)} \right] - \frac{1}{(GA_5)} \log [2m + 2n - 4] - \frac{1}{(GA_5)} \log \left[(2m + 2n) \times \left(\frac{\sqrt{35}}{6} \right)^{(\sqrt{35}/6)} \right] \\
 &\quad - \frac{1}{(GA_5)} \log \left[(2m + 2n - 2) \times \left(\frac{2\sqrt{42}}{13} \right)^{(2\sqrt{42}/13)} \right] - \frac{1}{(GA_5)} \log \left[(2m + 2n - 6) \times \left(\frac{4\sqrt{3}}{7} \right)^{(4\sqrt{3}/7)} \right] \\
 &\quad - \frac{1}{(GA_5)} \log \left[(2m + 2n - 6) \times \left(\frac{4\sqrt{10}}{13} \right)^{(4\sqrt{10}/13)} \right] - \frac{1}{(GA_5)} \log \left[(2) \times \left(\frac{4\sqrt{14}}{15} \right)^{(4\sqrt{14}/15)} \right] \\
 &\quad - \frac{1}{(GA_5)} \log [(2m + 2n - 8)] - \frac{1}{(GA_5)} \log [2] - \frac{1}{(GA_5)} \log \left[(2m + 2n - 3) \times \left(\frac{3\sqrt{7}}{8} \right)^{(3\sqrt{7}/8)} \right] \\
 &\quad - \frac{1}{(GA_5)} \log \left[(2m + 2n - 5) \times \left(\frac{12\sqrt{2}}{7} \right)^{(12\sqrt{2}/7)} \right] - \frac{1}{(GA_5)} \log [15mn - 19m - 19n + 23].
 \end{aligned}
 \tag{35}$$

4. Comparisons and Discussion for $Si_2C_3 - I[m, n]$

In this segment, we discussed many topological indices with their respective entropies. The quantitative and pictorial comparisons are illustrated in Tables 7–11 and Figures 5–12, respectively. Due to the complexity of molecular structures, different molecular descriptors in association with their entropy measures are used to anticipate the maximum structural information.

These descriptors possess a lot of chemical properties like Randić index which has good correlation between various physicochemical characteristics of alkanes such as retention times of chromatographic parameters in the Antoine equation for surface areas, vapor pressure, and boiling points, etc. Recently, the utilization of this index is related with medicine and pharmacological matters. Also ABC index can be a useful prognostic tool in the investigation of the heat formation in alkanes. It is also associated with stability of linear and branched alkanes both quantitatively

and qualitatively. Furthermore, the geometric arithmetic index provides better correlation coefficients as compared to other descriptors.

The Zagreb type indices are used to measure the total π -electron energy of the molecules [2]. In recent times, Zagreb indices along with their invariant have been employed to examine complexity and heterosystems [29]. These indices are also used for acquiring multilinear regression models as well as in QSPR and QSAR studies [30]. The forgotten index is useful in the analysis of pharmacological and chemical properties of medication atomic structures. The AZI index determines an excellent correlation of branched alkanes as well as linear alkanes. The strain energy of cycloalkanes is also estimated by this index. Furthermore, Balaban index is correlated with acute toxicity of mediums and variety of physicochemical properties. It is also helpful for transformation of heteroatoms. These indices are also used in designing the fractional bounds. Entropy function is monotonic as, in all cases, an increase of entropy measure is observed with the increase in the size of the molecular structure.

TABLE 7: Comparison of Randić entropies for $\text{Si}_2\text{C}_3 - I[m, n]$.

$[m, n]$	E_{R_1}	$E_{R_{-1}}$	$E_{R_{1/2}}$	$E_{R_{-1/2}}$
[2, 2]	2.48	0.46	2.20	1.16
[3, 3]	2.94	1.03	2.49	1.57
[4, 4]	3.23	1.33	2.77	1.84
[5, 5]	3.45	1.55	2.99	2.06
[6, 6]	3.62	1.72	3.16	2.23
[7, 7]	3.76	1.87	3.30	2.37
[8, 8]	3.89	1.99	3.45	2.49
[9, 9]	3.99	2.11	3.53	2.59
[10, 10]	4.09	2.20	3.62	2.69

TABLE 8: Comparison of E_{ABC} , E_{GA} , E_{M_1} , and E_{M_2} entropies for $\text{Si}_2\text{C}_3 - I[m, n]$.

$[m, n]$	E_{ABC}	E_{GA}	E_{M_1}	E_{M_2}
[2, 2]	1.46	1.80	2.35	2.48
[3, 3]	1.86	2.17	2.79	2.94
[4, 4]	2.14	2.42	3.08	3.23
[5, 5]	2.35	2.61	3.30	3.45
[6, 6]	2.52	2.77	3.53	3.62
[7, 7]	2.66	2.90	3.68	3.80
[8, 8]	2.78	3.01	3.73	3.89
[9, 9]	2.89	3.11	3.83	3.99
[10, 10]	2.98	3.20	3.93	4.11

TABLE 9: Comparison of E_{HM} , E_F , E_{AZI} , and E_J entropies for $\text{Si}_2\text{C}_3 - I[m, n]$.

$[m, n]$	E_{HM}	E_F	E_{AZI}	E_J
[2, 2]	3.17	2.78	2.61	1.66
[3, 3]	3.58	3.24	3.06	2.06
[4, 4]	3.85	3.54	3.34	2.33
[5, 5]	4.07	3.75	3.56	2.53
[6, 6]	4.23	3.93	3.73	2.69
[7, 7]	4.37	4.07	3.87	2.83
[8, 8]	4.50	4.19	3.99	2.95
[9, 9]	4.61	4.30	4.10	3.06
[10, 10]	4.70	4.40	4.20	3.15

TABLE 10: Comparison of the redefined Zagreb entropies for $\text{Si}_2\text{C}_3 - I[m, n]$.

$[m, n]$	E_{ReZG_1}	E_{ReZG_2}	E_{ReZG_3}
[2, 2]	1.51	1.761	3.19
[3, 3]	1.90	2.19	3.69
[4, 4]	2.17	2.47	3.99
[5, 5]	2.38	2.69	4.21
[6, 6]	2.54	2.86	4.39
[7, 7]	2.68	2.99	4.54
[8, 8]	2.80	3.12	4.66
[9, 9]	2.90	3.23	4.77
[10, 10]	2.99	3.32	4.87

5. Comparisons and

Discussion for $\text{Si}_2\text{C}_3 - II[m, n]$

Physicochemical properties depend upon their molecular structures. Thus modeling and prediction of these physicochemical properties and biological activities is an

important field of study. Physical organic chemistry will be intended for clarifying thoroughly how these properties are established by the structure. So in this consideration, one of the essential points is the choice of suitable topological descriptors embracing the information stored in the molecular structure. It is to be taken into consideration that due

TABLE 11: Comparison of the ABC_4 and GA_5 entropies for $Si_2C_3 - I[m, n]$.

$[m, n]$	E_{ABC_4}	E_{GA_5}
[2, 2]	1.34	1.69
[3, 3]	1.73	2.08
[4, 4]	1.99	2.35
[5, 5]	2.20	2.55
[6, 6]	2.36	2.71
[7, 7]	2.50	2.85
[8, 8]	2.62	2.97
[9, 9]	2.72	3.07
[10, 10]	2.82	3.17

FIGURE 5: (a) Randić entropy for $\alpha = 1$; (b) Randić entropy for $\alpha = -1$. FIGURE 6: (a) Randić entropy for $\alpha = (1/2)$; (b) Randić entropy for $\alpha = (-1/2)$.

to the complexity of these molecular structures, it is no possible to anticipate that a single descriptor would be able to contain all the structural information. This is the foremost purpose why the study for molecular structure descriptors remains through a usual procedure grounded on the required characteristics that a molecular structure descriptor requires to possess.

In this section, we estimated degree-based entropy measures. In [31, 32], many algorithms were recommended to examine the structural complexity. But the entropy approach is reviewed to be the most substantial approach to distinguish the structural information of the complex networks. Therefore, we have listed mathematically some degree-based entropies for small considerations of parameters

FIGURE 7: (a) The atom bond connectivity entropy; (b) the geometric arithmetic entropy.

FIGURE 8: (a) The first Zagreb entropy; (b) the second Zagreb entropy.

FIGURE 9: (a) The hyper-Zagreb entropy; (b) the forgotten entropy.

FIGURE 10: (a) The augmented Zagreb entropy; (b) the Balaban entropy.

FIGURE 11: (a) The redefined first Zagreb entropy; (b) the redefined second Zagreb entropy; (c) the redefined third Zagreb entropy.

FIGURE 12: (a) The ABC_4 entropy; (b) the GA_5 entropy.

TABLE 12: Comparison of Randić entropies for $\text{Si}_2\text{C}_3 - II[m, n]$.

$[m, n]$	E_{R_1}	$E_{R_{-1}}$	$E_{R_{1/2}}$	$E_{R_{-1/2}}$
[2, 2]	2.44	0.60	2.01	1.14
[3, 3]	2.99	1.02	2.46	1.56
[4, 4]	3.22	1.32	2.76	1.84
[5, 5]	3.44	1.55	2.98	2.05
[6, 6]	3.61	1.73	3.19	2.22
[7, 7]	3.76	1.88	3.29	2.36
[8, 8]	3.88	2.01	3.41	2.48
[9, 9]	3.99	2.11	3.52	2.59
[10, 10]	4.09	2.21	3.62	2.68

TABLE 13: Comparison of E_{ABC} , E_{GA} , E_{M_1} , and E_{M_2} entropies for $\text{Si}_2\text{C}_3 - II[m, n]$.

$[m, n]$	E_{ABC}	E_{GA}	E_{M_1}	E_{M_2}
[2, 2]	1.43	1.80	2.34	2.44
[3, 3]	1.85	2.17	2.78	2.92
[4, 4]	2.13	2.42	3.07	3.22
[5, 5]	2.34	2.61	3.28	3.44
[6, 6]	2.52	2.77	3.46	3.61
[7, 7]	2.66	2.90	3.60	3.76
[8, 8]	2.78	3.01	3.72	3.88
[9, 9]	2.88	3.11	3.83	3.99
[10, 10]	2.98	3.20	3.92	4.09

TABLE 14: Comparison of E_{HM} , E_F , E_{AZI} , and E_J entropies for $\text{Si}_2\text{C}_3 - II[m, n]$.

$[m, n]$	E_{HM}	E_F	E_{AZI}	E_J
[2, 2]	2.99	2.73	2.56	1.79
[3, 3]	3.51	3.22	3.03	2.16
[4, 4]	3.81	3.52	3.33	2.41
[5, 5]	4.04	3.70	3.55	2.61
[6, 6]	4.21	3.92	3.72	2.76
[7, 7]	4.36	4.06	3.87	2.89
[8, 8]	4.48	4.19	3.99	3.01
[9, 9]	4.59	4.29	4.10	3.10
[10, 10]	4.69	4.39	4.19	3.20

TABLE 15: Comparison of the redefined Zagreb entropies for $\text{Si}_2\text{C}_3 - II[m, n]$.

$[m, n]$	E_{ReZG_1}	E_{ReZG_2}	E_{ReZG_3}
[2, 2]	1.56	1.42	3.18
[3, 3]	1.93	1.93	3.67
[4, 4]	2.19	2.24	3.98
[5, 5]	2.39	2.46	4.20
[6, 6]	2.54	2.64	4.38
[7, 7]	2.68	2.79	4.53
[8, 8]	2.80	2.92	4.65
[9, 9]	2.90	3.03	4.76
[10, 10]	2.99	3.13	4.86

TABLE 16: Comparison of the ABC_4 and GA_5 entropies for $Si_2C_3 - II[m, n]$.

$[m, n]$	E_{ABC_4}	E_{GA_5}
[2, 2]	1.34	1.64
[3, 3]	1.73	2.05
[4, 4]	1.99	2.32
[5, 5]	2.20	2.53
[6, 6]	2.36	2.70
[7, 7]	2.50	2.84
[8, 8]	2.62	2.96
[9, 9]	2.72	3.06
[10, 10]	2.81	3.16

FIGURE 13: (a) Randić entropy for $\alpha = 1$; (b) Randić entropy for $\alpha = -1$. FIGURE 14: (a) Randić entropy for $\alpha = (1/2)$; (b) Randić entropy for $\alpha = (-1/2)$.

for $Si_2C_3 - II[m, n]$. Also, we produce Tables 12–16 with the help of Matlab for small estimations of m, n . From tables, we can note that all the evaluation of entropy is in growing request as the values of parameters are expanded. These

estimations are very helpful for the chemist to analyse chemical properties of the structures. The graphical representation of computed findings is demonstrated in Figures 13–20 for certain measurements of m, n .

FIGURE 15: (a) The atom bond connectivity entropy; (b) the geometric arithmetic entropy.

FIGURE 16: (a) The first Zagreb entropy; (b) the second Zagreb entropy.

FIGURE 17: (a) The hyper-Zagreb entropy; (b) the forgotten entropy.

FIGURE 18: (a) The augmented Zagreb entropy; (b) the Balaban entropy.

FIGURE 19: (a) The redefined first Zagreb entropy; (b) the redefined second Zagreb entropy; (c) the redefined third Zagreb entropy.

FIGURE 20: (a) The ABC_4 entropy; (b) the GA_5 entropy.

6. Conclusion

In this study, we considered the molecular structure of silicon carbide $Si_2C_3 - I[m, n]$ and $Si_2C_3 - II[m, n]$. We estimated degree-based indices like general Randić index, ABC index, GA index, Zagreb type indices, forgotten index,

hyper-Zagreb index, AZI index, Balaban index, redefined Zagreb indices, fourth atom bond connectivity index, and fifth geometric arithmetic index. Afterwards, we extend our computation towards the estimation of corresponding entropies of aforementioned degree-based indices. We compared these estimations both numerically and graphically.

These entropies associate particular physicochemical characteristics like distortion, stability, melting points, and strain energy of chemical compounds. The mathematical findings for these graphs are helpful for the chemist to understand the biochemical utilization of these structures.

Data Availability

The data used to support the findings of this study are cited at relevant places within the text as references.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

All authors contributed equally to this work.

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