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Research Article

Preparation and Mechanical Characterization of TiC Particles Reinforced Al7075 Alloy Composites

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The current exploration work focuses on the fabrication of aluminum 7075 matrix composites built up with different weight levels of titanium carbide particles by a traditional stir casting process. In particular, the combination of high hardness and flexible modulus, low density, great wettability, and low synthetic reactivity with aluminum melt makes TiC particle an attractive material. From 0% to 6 wt.% of reinforcement is introduced in steps of 3 wt.%. Aluminum matrix composites are studied in depth to learn more about their microstructures and mechanical properties. TiC particles were uniformly dispersed in the aluminum lattice, as shown by scanning electron micrographs of the material's microstructure. As the weight of the TiC particles in the aluminum lattice increases, so does the density of the composites. The X-ray diffraction technique has also been used to detect the phase of TiC particles. As the amount of TiC particles in the aluminum matrix increases, the material's mechanical properties, such as ultimate tensile strength and hardness, increase at the expense of ductility. The preorganized composites have also undergone fractography testing.

1. Introduction

Constant progress is being made in the field of metal matrix composites (MMCs). Here, metal serves as a matrix for reinforcements like art or natural materials. As a result of their portability, aluminum (Al), magnesium (Mg), and titanium (Ti) are frequently used as metallic matrix materials [1–3]. Because of the cooperation of its constituting stages, such as metal matrix and ceramic reinforcement, ceramic-built metal matrix composites are regarded as exceptionally distinctive materials for the purpose of primary applications, thanks to their great property blends like malleability, durability, high strength, and high modulus [4, 5]. The physical and mechanical properties of composites are heavily influenced by the reinforcement type and fabrication method [6]. There are a few different states that reinforcement can be in, including fiber, particulate, and hair. In order to enhance the composite's properties, it is crucial to select the matrix, reinforcement, and reinforcement state appropriately [7–9]. Due to its high solidarity-to-weight ratio, ease of manufacture, and low fabrication cost, aluminum, and its combinations have become the most widely used nonferrous metals in recent years [10]. The aluminum matrix composite (AMCs) assumes a critical part in upgrading the properties of the material that are pertinent in auto businesses, marine, aviation, and so on. Though these AMCs were additionally explored with the mix of building-up particulates in various rates, it fully intent on improving the attributes of the parent aluminum matrix. Bringing ceramic particulate fortifications into an aluminum network delivers a composite with better physical, mechanical and tribological properties in contrast with the traditional designing materials. The principal motivation behind delivering aluminum matrix composites (AMCs) is to foster lightweight materials having high solidness and high unambiguous strength. Aluminum metal matrix composites (AMMCs) reinforced with artistic particles made of aluminum are simple, easy to work with, and may even provide tailor-made property combinations [11]. As a result of being able to mix and match their properties, composites are now superior to metals in many automotive and aviation uses [12]. Fortifying of both the direct and indirect aluminum composite is facilitated by the normal properties of clay fortifications, such as high hardness and low coefficient of thermal development [13]. Hard-fired composites, such as SiC, B_4C, Al_2O_3, AlB_2, TiB_2, and TiC, are commonly used to foster AMMCs [14] for the production of automobile parts that function in a rubbing and temperature climate. With their high-intensity conductivity, high unambiguous modulus, low density, and stability at high temperatures [15], the literature suggest that TiC reinforcement is a promising material for the development of AMMCs. These materials must have the option to help with a high strength-to-weight ratio, distortion, or crack during execution and keep up with controlled grating and wear over significant stretches without extreme surface harm [16].

Among all-aluminum chemical families, the new age series 7 series contains zinc as a focal alloying component and high-strength combination; they are common in aviation and automobile applications. When nanosized particles are added to the matrix of aluminum, there are gigantic outcomes shown by composites as far as strength and flexibility because of changes in the system of hardening for nano-sized reinforcement. Al7075 (Al–Zn–Mg–Cu) amalgam is a significant individual from the 8xxx series chemicals and is widely utilized in the avionic business attributable to its light weight and high mechanical execution [17]. Many endeavors have been made to additionally work on the mechanical properties of the 7075 aluminum chemical. Improvement in the exhibition of most aluminum combinations can be credited to adjustments to chemical synthesis and additionally utilizing new fabrication strategies [18]. Al7075 are significant chemicals among 7xxx series aluminum combination assignments and are generally utilized in safeguard areas because of intrinsic properties like light weight and high strength materials when contrasted with solid materials [19]. Executions of the aluminum-based chemicals are enormously worked on by shifting the substance arrangement and by using novel fabrication procedures. AMMCs can combine through different strategies, for example, powder metallurgy, dispersion holding, substance fume testimony in-situ technique, mix projecting, and so on [20]. Yet, among all mixed projecting strategy is extremely well known on account of its highlights like expense viability, straightforwardness, and huge scope fabrication. Ultrasonic helped mix projecting is advancement in further developing molecule dispersion and getting homogeneous nanocomposites. The particulates reinforced with aluminum lattice stage show great strength when and flexibility because of varieties in cementing components. The fluid metallurgy course is prudent and simple to manufacture. Ultrasonic helped mix projecting is an original strategy to blend the composites and prompts vortex development between the two stages. Its fabrication limit and cost viability offer it more consideration. A few elements are being considered with the utilization of mix projecting for creating aluminum metal-lattice composites, this incorporates acquiring homogeneous dispersion of hard clay or reinforcementing particles inside the matrix, laying out wettability among network and reinforcement stage to get great intermetallic security and limiting the porosity in MMCs. These variables can be accomplished by taking the legitimate place of the stirrer and furnace temperature. Right now, both aluminum and aluminum combinations are utilized broadly in auto and aviation parts because of their high unambiguous strength, flexibility, and ductility. Be that as it may, they have unfortunate wear obstruction, which increments upkeep costs complex. Then again, Al amalgam MMCs offer much better wear obstruction, as well as mass properties. Due to its high melting temperature (3160°C), low thermal coefficient of development, unprecedented hardness, fantastic wear, and good abrasion resistance [21], TiC particulates have recently received a lot of attention as a ceramic reinforcement to Al chemical matrix nanocomposites.

Conventional aluminum combinations have generally high strength at room temperature, the mechanical properties will be diminished over half when the temperature is higher than 473K, which restricts their application at high temperatures. A potential method for taking automobile of the issue is to bring TiC particles into the network [22]. It is demonstrated by elevated temperature tractable testing that aluminum matrix composites reinforced with TiC fortifications hold their room temperature strength up to 2500°C. TiC particulates pottery shows a high melting point, high hardness, and high wet blanket opposition. Subsequently, the presentation of TiC particles ought to altogether further develop the high-temperature properties of the composite, particularly the high-temperature creep obstruction. Strong chemical bonds can be formed in aluminum even when the compound is at room temperature. When aluminum amalgam is used at high temperatures, its strength and other mechanical properties degrade. Consolidating reinforcement (TiC) into the aluminum matrix can solve this problem [23].

This article focuses on the design and description of TiC particles used to reinforce AMMCs, including how well they work with aluminum lattices, whether or not their properties improve after the presentation, and so on. The literature shows that TiC can be used as a reinforcement in AMMCs because of its remarkable mechanical and wear properties, high thermal shock obstruction, and great thermal conductivity. Al/TiC AMCs were found to have a higher strength-to-weight ratio than unreinforced composites in a number of tests. TiC particulate-based composites have the potential to be used as a high-level underpinning material due to their exceptional property blends, including high mechanical strength, great protection from wear and consumption, and high synthetic and thermal steadiness at both ambient and elevated temperatures. This nonoxide clay is appealing for a variety of uses, such as bearing material, because of its low density, high dissolving point, great wear obstruction, and sturdiness. TiC is used unmistakably in heat exchanger assembly, guidance, motor components, and turbine edge applications. Similarly, on 7XXX composites, only a minimal amount of work has been done on TiC reinforcement. Thus the current papers manage the planning and portrayal of Al7075–TiC MMCs including the assessment of microstructure, mechanical properties, and fractography conduct of TiC composites. In the current work, composites work Al7075 alloy with 3 and 6 wt.% of 70 to 80 micron-sized TiC particles reinforced composites were manufactured, the microstructure was described, and mechanical properties, for example, hardness and density were likewise contemplated.

2. Fabrication Process

2.1. Experimental Details. In this work, Al7075 was picked as a lattice material and TiC particle as a reinforcement material. The stir cast process has been used for creating the composites. Al7075 lattice material was melted in a crucible furnace heater and the different weight rates of TiC reinforcement particles were mixed to create the different syntheses of the composites. The proposed AMC was fabricated involving Al7075 having the chemical arrangement as displayed in Table 1. The building-up molecule was TiC particles with a particle size of 70–80 microns as in Figure 1. Table 2 gives the details of TiC reinforcement particles and Al7075 alloy.

The Al7075–TiC composite used in this investigation was made via a stir casting process. 1,000 grams of Al7075 alloy were melted at 750°C in a mud graphite cauldron, and the resulting rods were 25 mm in diameter and 75 mm in length. The aluminum melt should have a uniform distribution of reinforcement if the mixing process was conducted properly. A mechanical stirrer was used to help the melt blend into a tight vortex. TiC-fired powder in the range of 70–80 m in size was preheated to 600°C in order to oxidize the surface of the reinforcement particles. A constant stream of heated TiC powder was fed into a rotating aluminum dissolve vortex. In order to provide a passive subterranean environment, argon gas was added to the liquid mixture throughout the entire cycle. In order to study the properties of aluminum composite projection, motion and degassing tablets were placed over the pot. The mixture was stirred continuously for 10 to 15 minutes with a mechanical stirrer operating at 400 revolutions per minute on the impeller. While the particles were growing in size, the melt temperature was maintained at 750 degrees Celsius. After the die was heated, the liquid metal was poured in, and the resulting casting rods measured 15 millimeters in diameter and 125 millimeters in length. The same method is utilized when making AMCs out of 6 wt.%

Table 1: Chemical composition of Al7075 alloy by weight%.

Zn	Mg	Si	Fe	Cu	Ti	Mn	Cr	Al
6.1	2.1	0.4	0.5	1.5	0.01	0.3	0.18	Balance

Table 2: Properties of Al7075 alloy and TiC particles.

Material	Hardness (BHN)	Density (gm/cm^3)	Elastic modulus (GPa)	Tensile strength (MPa)
Al7075	70	2.82	70	220
TiC	2810	4.93	400	345

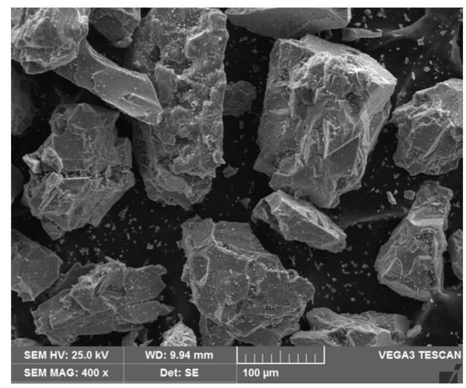


Figure 1: SEM of TiC particles.

TiC composites. Figure 2 depicts examples of Al7075–TiC composites.

Cast AMC samples were prepared for microstructures concentrate using conventional metallographic methods. The manufactured AMCs were analyzed by scanning electron microscopy to determine their metallographic properties (VEGA3 TESCAN). Besides the hardness and elasticity testing, an X-beam diffraction (XRD) study was also conducted. The fabricated composite examples were cleaned with grits of 200, 400, 600, 800, and 1000 before being scratched with Keller's etchant. Keller's reagent ($HNO_3 + HCL + HF$) was used to etch the samples after they were meticulously cleaned with grating paper and velvet material. Using a Brinell hardness analyzer and a load of 250 kgf for 10 seconds, we were able to estimate the hardness of the cleaned tests. The ASTM 08-compliant elastic examples were prepared. Figure 3 depicts the illustrative parts. For this purpose, an electronic universal testing machine was used to make estimates of both the ultimate tensile strength (UTS) and the compression strengths. Utilizing the Archimedean rule, we were able to make a rough estimate of the densities of the manufactured composites [24].

3. Results and Discussion

3.1. Microstructural Studies. Scanning electron micrographs (SEM) of cast Al7075 composites containing 3 and 6 wt% TiC are shown in Figure 4 ((4a)–(4c)). Images captured using a scanning electron microscope reveal the presence of

Figure 2: Al7075–TiC composites after casting.

Figure 3: Tensile test specimen.

TiC particles in a metal matrix composed of aluminum. Composite scanning electron micrographs (Figure 4) revealed a dense interface between the metal matrix and the TiC particles ((4b)-(4c)). Figure 4 shows scanning electron micrographs of AMCs manufactured with varying weight percents of TiC reinforcement. The micrographs show that 3–6 wt% TiC particles are uniformly dispersed throughout the aluminum matrix. We can thank effective mixing and good cycle limits for this behavior.

It is likewise seen that the expansion of TiC particles kept the grains from becoming as extensive as the unadulterated Al7075 chemical. The option of reinforcement particles in the dissolve expanded the number of nucleation destinations, by giving extra substrate during cementing, and diminished the grain size. Figure 4 ((4b)-(4c)) shows the SEM picture of unadulterated TiC-fired particles utilized in the current examination. Aluminum built up with TiC particles, composites are effectively manufactured by traditional mix projecting handling technique. The microstructure of cast Al7075 contains a strong arrangement of aluminum and between dendritic arrangements.

X-ray diffraction (XRD) exhibits the reasonable parts present in the composite. Figure 5 ((5a)-(5b)) exhibits the XRD of as-cast Al7075 alloy and Al7075 with 6 wt.% of TiC composites, respectively. An XRD result gives insights into the various components existing in the manufactured composites. XRD examination displayed in Figure 5(b) affirms the presence of TiC particulates inside the aluminum network. A sluggish unimportant move of the Al peaks to higher places, with an extension in the weight% of the TiC, is seen that the pinnacle of Al in the manufactured AMCs is somewhat moved to bring down 2 theta points when contrasted with that of aluminum chemicals. The Al is available as stage for example Al (2 2 0), Al (3 1 1), Al (1 1 1), Al (2 0 0), Al (2 2 2). These pinnacles are perceived with the assistance of JCPDS programming. The XRD results likewise endorse the essential guide result which confirms that manufactured composites are TiC reinforced composites.

3.2. Density Measurements. Al7075 alloy and Al7075 with 3 and 6 wt.% of micro-TiC samples are shown in Figure 6. The theoretical and experimental values for each sample are shown. This study's experimental values are expected to be close to the theoretical values because the theoretical values calculated are close to the experimental values obtained through an experimental method. Because theoretical values are calculated using standardized formulas, it is nearly impossible to get the experimental values to exactly match the theoretical values. The weight method is used to measure the density of Al7075 and Al7075 with 3 and 6 wt% of TiC composites.

The density of aluminum alloy Al7075 is 2.82 g/cm^3, the density of titanium carbide is 4.93 g/cm^3, and the density of aluminum alloy reinforced with 6 weight percent TiC is 2.894 g/cm^3. The overall density of the composite is increased because the TiC density is higher than the Al7075 alloy density. Similarly, the theoretical density of the composite tends to be higher than that of the aluminum alloy when TiC particles make up 3 to 6 wt.% of the Al7075 alloy. In addition, it is worth noting that actual densities are lower than predicted.

3.3. Hardness Measurements. The composite's toughness is owed to the lattice material's reinforcing properties. Large amounts of disengagements are created at the molecule matrix interface during the hardening process because the coefficient of thermal development of TiC particles is not the same as the aluminum combination. There will be an increase in the matrix's toughness as a result of this. Increases in hardness, as shown in Figure 7, are directly proportional to the amount of TiC present in the material. By increasing the weight percent of reinforcement, the lattice is bolstered, and the composite material gains in hardness. Grain boundary strength increases to a maximum, and iota separation is reduced. A greater concentration of hard TiC particles is largely responsible for the increased density. Hard TiC particles in the aluminum lattice may be to blame for this phenomenon. The surface area of the reinforcement particles is improved as they are consolidated in the aluminum matrix, and the size of the aluminum network grains is reduced. In the presence of these abrasive TiC particle surfaces, plastic distortion is greatly reduced, increasing the manufactured AMCs' hardness. The addition of microparticles is what causes the increased toughness. Grain growth can be stifled, precious stone grains can be further developed in the network, and grain-refined Al7075–TiC composites can be influenced by the addition of microparticles. The Hall-Petch strengthening system is responsible for the increased hardness due to the Orowan system induced by the showdown of meticulously fanning out hard particles to the death of disengagements in the composites [25].

3.4. Tensile Properties. Figures 8 and 9 show the results of tensile testing at room temperature with varying weight% of 70 to 80 micron-sized TiC particles. The UTS and YS increase as the wt. fraction of reinforcing particles increases, as shown in Figures 8 and 9.

The UTS and YS are amplified with increasing TiC content. The TiC particles in the alloy afford a shield to the softer matrix. The UTS and YS of as-cast Al7075 alloy are 214.7 MPa and 184.5 MPa, respectively. Furthermore, as the weight percentage of micron-size TiC particulates increased from 3 to 6 wt.% in steps of 3 wt.%, there is an increase in the

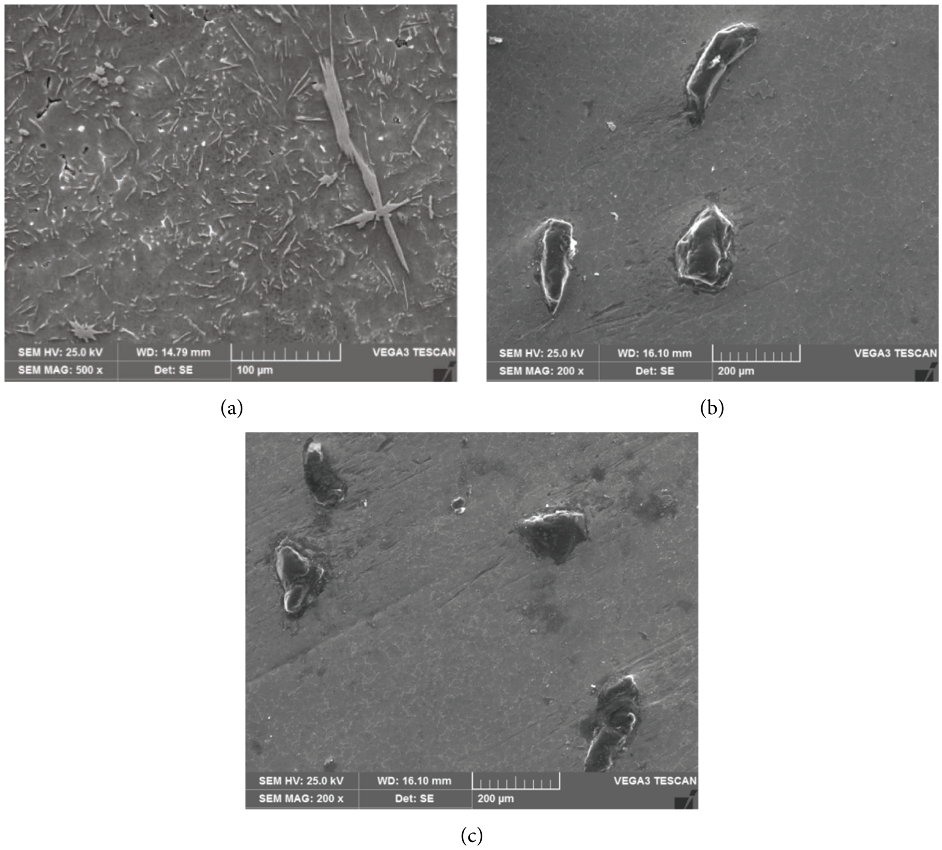


FIGURE 4: SEM images of (a) as-cast Al7075, (b) Al7075-3 wt% TiC, and (c) Al7075-6 wt.% TiC composites.

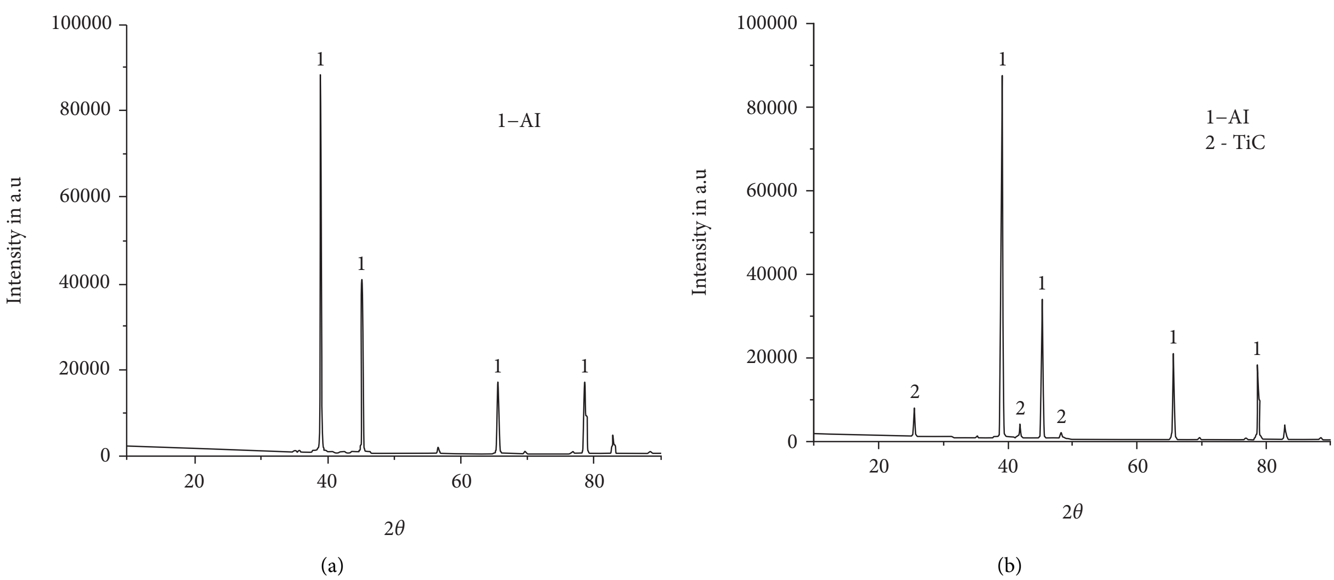


FIGURE 5: XRD patterns of (a) as-cast Al7075 and (b) Al7075-6 wt% TiC composites.

UTS and YS values. It is observed that in Al7075 alloy—wt.% TiC composites UTS and YS are 240.4 MPa and 202.8 MPa, respectively. In the case of 6 wt.% of micron-size TiC reinforced composites it is 274.9 MPa and 240.8 MPa, respectively, in UTS and yield strength.

The appearance of hard TiC particles in the aluminum lattice may be responsible for the observed increase in UTS. These tough TiC particles act as a reinforcing instrument, lending cohesion to the aluminum matrix. This is achieved through the transfer of load from the reinforcement particles

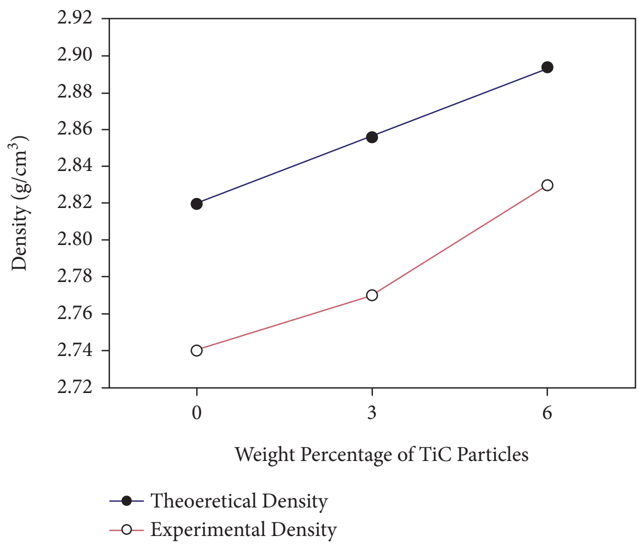


Figure 6: Density of Al7075 alloy with TiC composites.

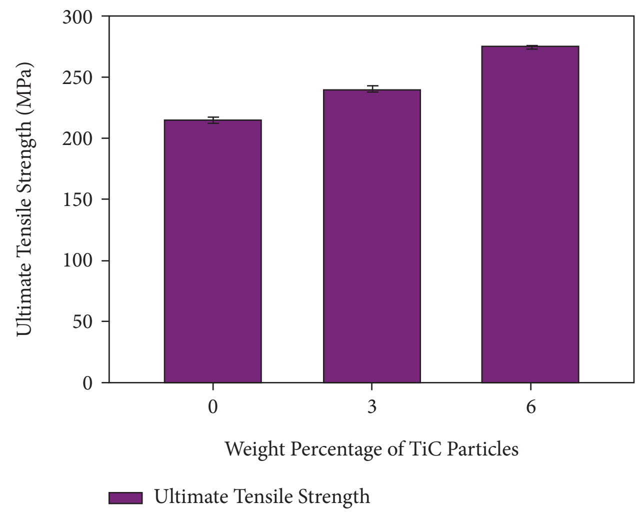


Figure 8: Ultimate strength of Al7075 alloy with TiC composites.

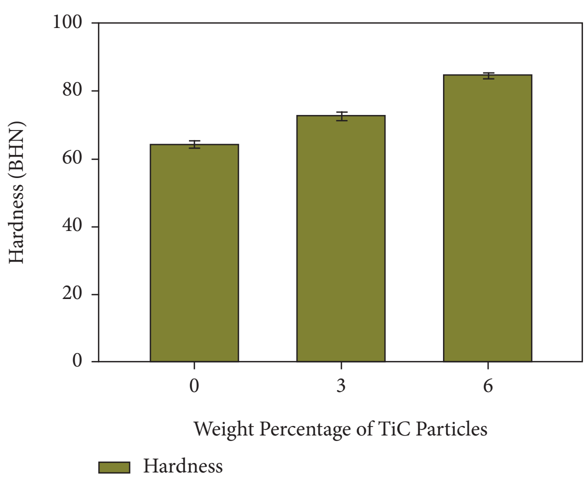


Figure 7: Hardness of Al7075 alloy with TiC composites.

to the matrix, which allows the resulting network to provide greater resistance to the elastic pressure applied during fabrication. TiC particles have a thermal extension coproductivity of $1.4–3.7 \times 10^{-6}$/K, while aluminum's is 24×10^{-6}/K. Higher separation density in the lattice and burden-bearing limit of hard reinforcement particles is produced by this thermal extension between the matrix and reinforcement particles, which increases the strength of the AMCs [26]. The matrix's microscopic underlying qualities change with an incidental commitment to strengthening when the low coefficient of thermal development (CTE) reinforcement particles ascend to a higher coefficient of thermal extension lattice.

Further, expansion in strength might be ascribed in light of the burden move of reinforcement particles to the lattice, which expands the heap bearing limit of manufactured composites which results in an acceleration in strength. Same consequences of expansion in elasticity with expanding measure of reinforcement in the network no matter what the fabrication strategy for AMCs were obtained by past scientists. This upgrade in strength may be credited to the refinement of grains because of the presence of TiC particles, which is additionally in concurrence with the Hall-Petch interrelation [27]. Expansion in everyday separation density all around the TiC particles because of the CTE confusion of Al base matrix and TiC particles in the midst of solidifying furthermore add to the strength. Colossal disfigurement builds the holding strength between the particles and base lattice and licenses the heap to reasonably move by Al7075/TiC standard particle interface. Exceptionally minor particles fill the holes of immense particles and upgrade the extra constraint of building up.

The correlation between the particle weight of TiC and the rate of AMC extension after fabrication is shown in Figure 10. As the size of the TiC particles grew in the aluminum matrix, the rate of expansion slowed down. Since TiC as a reinforcement is weak, the particles' brittle behavior plays a significant role in reducing ductility, and the resulting weakness in the manufactured composites reduces the composites' flexibility. Increasing the wt% of TiC particles in the composites also decreases the pliable matrix content, which leads to a decrease in the composites' rate of extension. There was no discernible difference in the results achieved by the prior examiners, who saw a reduction in elongation as a percentage with increasing reinforcement in the aluminum matrix across all composite fabrication cycles.

Furthermore, the occurrence of hard and weak TiC particles within the soft and malleable Al7075 network reduces the ductility content of fabricated AMCs due to the lack of flexible substance of matrix metal in the composite, which significantly increases the hardness of fabricated AMCs [28]. An increase in reinforcement area in the lattice leads to a greater separation density during cementing as a result of thermal crisscross between the aluminum matrix and the reinforcement. Aluminum lattice distorts plastically to support the more modest volume extension of reinforcement particles as a result of the confusion of thermal development between the aluminum network and

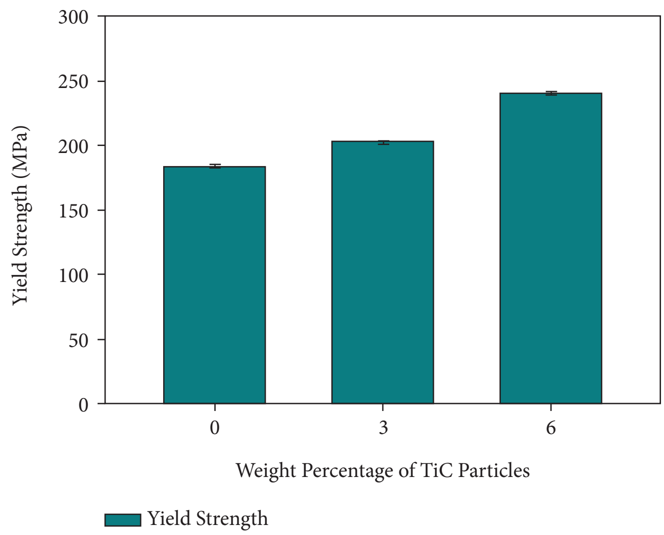


Figure 9: Yield strength of Al7075 alloy with TiC composites.

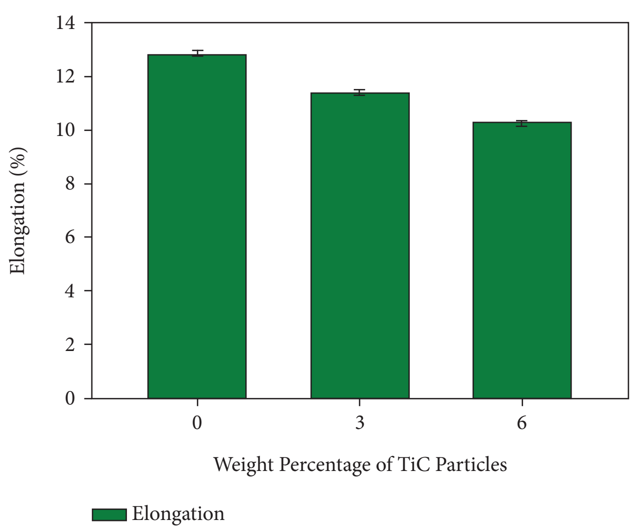


Figure 10: Elongation of Al7075 alloy with TiC composites.

reinforcement caused by temperature difference. Increased resistance to plastic deformation is the result of increased disengagement density at the interface between molecules in a network, leading to increased hardness. The results obtained by nonspecialists agree with this [29]. Figure 11 ((11a)–(11c)) is showing the stress-strain curves of as-cast Al7075 alloy, Al7075 with 3 and 6 wt.% of TiC reinforced composites. From the plots as the wt% of TiC increased from 3 to 6 wt., there is an increase in the stress of composites.

3.5. Tensile Fractography. The tensile fracture way of behaving of Al7075/TiC MMCs, which were projected by the stir process, was concentrated on in the current work as in Figure 12 ((12a)–(12c)). Assessment of the tensile fracture surfaces uncovers highlights of locally ductile and brittle mechanisms. The elements affecting the ductile and brittle crack are the nonuniform circulation of TiC particles in the Al7075 aluminum composite metal network, and the arrangement of second stages during projecting. Failures of the reinforcement TiC particles by both decohesion and breaking are clear on the malleable crack surfaces. The properties of the aluminum MMCs depend not just on the network molecule and the weight division yet in addition on the circulation of the building-up particles and the connection point holding between the molecule and the lattice. Break surface investigation uncovered various geographies for the composites containing different weight rates of TiC particles. The consequences of the crack surface investigations led to break durability examples of FCC organized Al7075 (Figure 12(a)) combination tests uncovered huge dimples, alongside a lot of plastic disfigurement, demonstrating a flexible crack. The break surfaces additionally display fine and shallow dimples, demonstrating that the crack is malleable, as displayed in Figure 12(a). The crack way of behaving is represented by two fundamental mismatches between the reinforcement particles, lattice combination and the subsequent stages accelerated during the projecting and heat treatment also. The principal mismatch is the distinction in the strain conveying ability between the hard and intrinsically weak reinforcementing TiC and the ductile and brittle aluminum amalgam metal lattice. The subsequent cast-offs are because of contrasts in the coefficient of thermal extension between the TiC particles, the Al7075 aluminum composite network, and the accelerated stages.

The principal crisscross advances pressure focus close to the reinforcement TiC. This present circumstance produces ideal circumstances for the TiC particles, second stages (response chemicals and intermetallics) and groups to break and consequently, the detachment (decohesion) of TiC particles from the nearby network composite. Synchronous disappointment of the reinforcement TiC, second stage particles in the composite microstructure is represented by the battling impacts of neighborhood plastic requirements, molecule size and level of grouping. The neighborhood

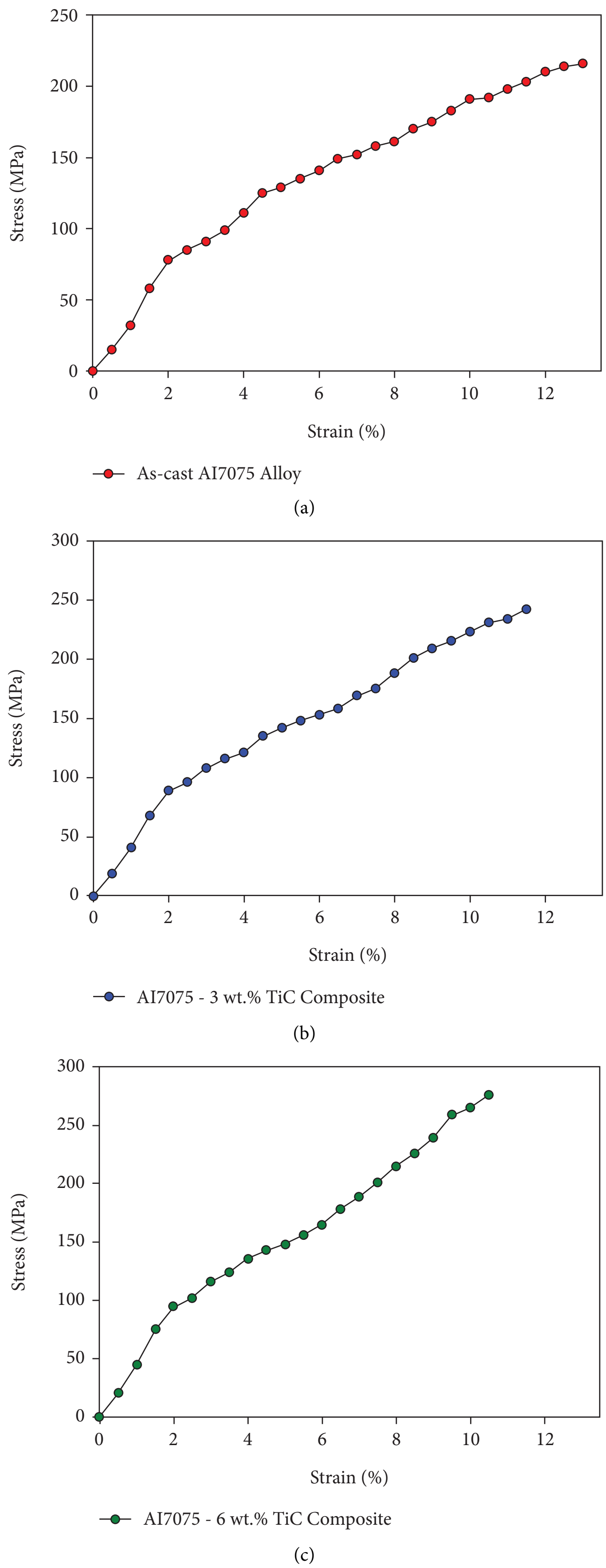
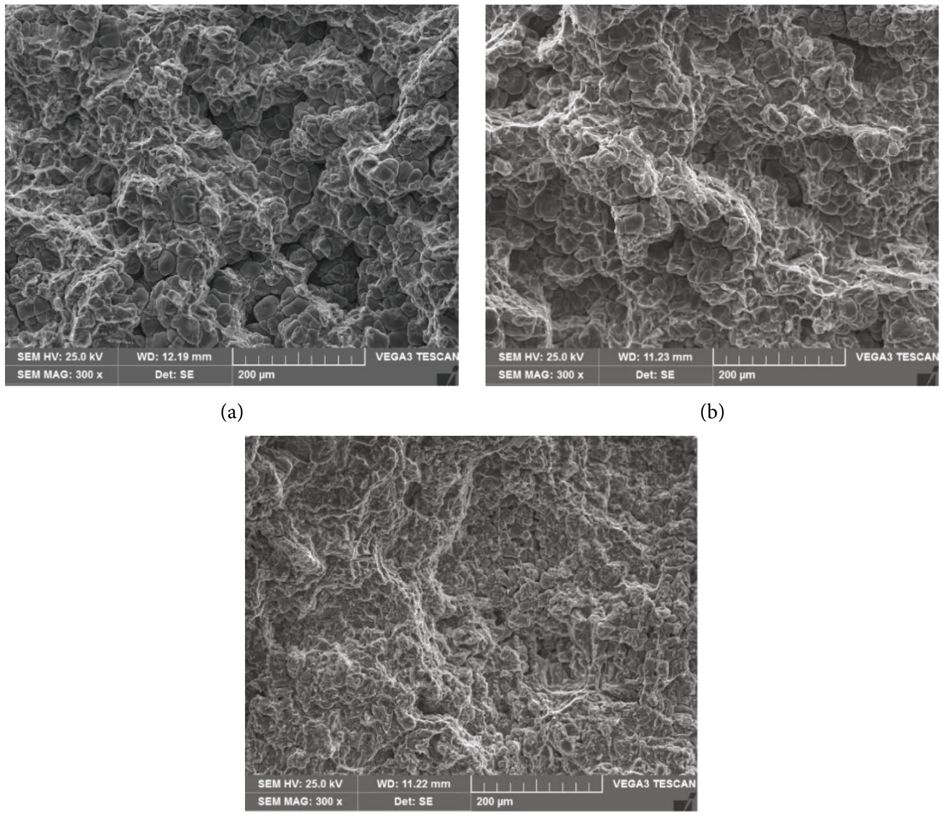


Figure 11: Stress-strain curves of (a) as-cast Al7075, (b) Al7075-3 wt% TiC, and (c) Al7075-6 wt.% TiC composites.



(a) (b) (c)

Figure 12: Tensile fractured surfaces of (a) as-cast Al7075, (b) Al7075-3 wt% TiC, and (c) Al7075-6 wt% TiC composites.

plastic limitations are especially significant for the bigger estimated particles and molecule bunches during the composite crack. The crack method of the matrix combination which changed from bendable to cleavage type (on account of MMCs) was ruled with microcrack nucleation and propagation, at higher reinforcement content Figures (12b-12c).

Void nucleation happens at molecule/matrix interfaces and can be acknowledged by either interface decohesion or molecule breaking [30]. The minute voids are related to the disappointment of the bendable metal matrix between the reinforcement particles, while the plainly visible voids are combined with the reinforcement TiC. The wellsprings of plainly visible voids and resultant shallow dimples on the broken surface are the basic occasions controlling both the crack and decohesion of the reinforcement TiC particles. The requirements are prompted by the presence of hard and weak carbon (TiC) molecule fortifications in the delicate and malleable 7075 metal matrix. The voids then, at that point, develop under both the applied burden and the impact of nearby plastic limitation until a blend component is enacted, and this is trailed by the complete disappointment of the example. The void combination happens when the void lengthens to the underlying intervoid dividing. This prompts the dimpled appearance of the broke surfaces.

4. Conclusion

The Al7075 alloy with TiC particles between 70 and 80 microns in size and MMCs with 3 and 6 wt.% is effectively produced via the stir cast route. SEM micrographs reveal a consistent distribution of TiC particles throughout the Al7075 alloy. The XRD analysis revealed the presence of TiC particles in the man-made composites, which contained TiC at 6 different weight percentages. TiC phases have been confirmed by XRD analysis to be present in the Al2014 alloy matrix. The UTS and YS hardness of TiC reinforced composites have improved, and their ductility has grown marginally. Fractographic analysis of tensile-ruptured surfaces using SEM revealed the different fracture mechanisms of the base alloy Al7075 alloy and produced composites.

Data Availability

No data were used to support the study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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