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Retraction

Retracted: Study on Preparation of Elastic Silica Aerogel Based on SEM Analysis

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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[1] G. Qu, X. Feng, Y. Wang et al., "Study on Preparation of Elastic Silica Aerogel Based on SEM Analysis," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 6165710, 6 pages, 2022.

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Research Article

Study on Preparation of Elastic Silica Aerogel Based on SEM Analysis

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In order to explore and study the preparation of elastic silica aerogel, it is studied and discussed on the basis of SEM. The overall effect, comprehensive performance, and coupling degree of the preparation of silica gel are compared and analyzed by conventional analysis method and SEM analysis method, and it can be clearly seen that the SEM analysis method is better than the previous conventional analysis method. The scanning speed, working distance, imaging resolution, and result accuracy of the SEM analysis method are higher. At the same time, the SEM analysis method is simpler than the ideal process. According to the special properties of the material itself, the nanoporous materials are with high porosity, high specific surface area, low density, and low thermal conductivity; and the porous three-dimensional spatial network structure, in optics, electricity is widely used in thermal insulation, environmental protection, catalysis, chemical industry, and other fields. Based on SEM, the instrument has high resolution, deep image field, three-dimensional sense, simple sample preparation, and comprehensive analysis; the silica aerogel has a spatial network structure, with an aperture range of 10~50 nm; compared with ordinary silica aerogel gel, the preparation of elastic silica aerogel can withstand higher temperature based on SEM analysis; stable quality and elasticity expand the application range of aerogel gel, making it more widely used in shock absorption, heat insulation, sound insulation, and other fields, effectively achieving the goal of energy conservation and emission reduction.

1. Introduction

Scanning electron microscope (SEM) is a modern cell biology research tool invented in 1965. It mainly uses secondary electronic signal imaging to observe the surface morphology of samples, that is, scanning samples with extremely narrow electron beam, it has the characteristics of large depth of field, high resolution, intuitive imaging, strong stereo sense, and wide magnification range, and the sample to be measured can be rotated and tilted in three-dimensional space. In addition, it has the advantages of rich types of measurable samples, almost no damage and pollution to the original samples, and the morphology, structure, composition, and crystallographic information can be obtained at the same time. Various effects are produced through the interaction between the electron beam and the sample, mainly the secondary electron emission of the sample. The secondary electron can produce an enlarged image of the sample surface. This image is established according to the time sequence when the sample is scanned, that is, the amplified image is obtained by using the point by point imaging method. According to Liangcheng et al. (2019), silica aerogel is a new structure controlled pore forming material, which has a variety of unique properties such as low refractive index, low elastic modulus, low resistance, low thermal conductivity, strong adsorption, and typical fractal structure. It can be made into high-performance materials such as acoustic impedance coupling materials, filter materials, and high-temperature thermal insulation materials. It can prevent and reduce reflection in Hebron, detectors, catalysts, and catalyst carriers and can be used in high-efficiency rechargeable batteries, broadband glare coating, low dielectric constant insulating layer, ultrahigh speed integrated substrate, high-reflective film laser damage threshold, high-efficiency

thermal insulation coating, and other fields [1]. According to Su et al. (2020), aerogel is the solid material with the lowest density and the best thermal insulation performance in the world so far. It is widely used in the fields of environment, energy, aerospace, oil, transportation, and so on. Silica aerogel gel is an outstanding representative of aerogel gel family. It has the best comprehensive performance and the cheapest price. It is also the first aerogel gel to appear and commercialize [2]. Guo et al. (2021) analyzed the effects of heat treatment at different temperatures on the properties of silica aerogel gel composites by means of scanning electron microscope, infrared spectrometer, porosity tester, specific surface area, and xrdd. The high-temperature resistant silica aerogel gel composites can be reused [3]. Wu (2016) studied that silica aerogel has the characteristics of good thermal insulation, low density, low sound transmission rate, and large surface area because of its special structure, which enhances the prospect of silica aerogel [4]. Chen et al. (2017) proposed that silica aerogel has been applied in many fields. Silica aerogel with three-dimensional nanopore structure has the characteristics of high porosity, low density, and large specific surface area. Silica aerogel is generally obtained through sol-gel process, aging, and drying [5]. Lin (2017) analyzed the characteristics, preparation methods, and characterization process of aerogels. The sol-gel process, replacement solvent, and CO2 supercritical fluid drying method were used to prepare aerogels with the best performance [6]. Luo and Gan (2021) have done a lot of research on the reinforcement and modification of silica aerogel gel materials and improved the strength, toughness, and integrity of gel by means of composite or cross-linking, making the practical application of silica aerogel thermal insulation materials possible [7]. According to Liu et al. (2019), silica aerogel gel is a new lightweight porous material. In the areas of aviation, building materials, and medical treatment, they described the development process of the preparation process of silica aerogel and introduced the optical, thermal, electrical, acoustic, and catalytic properties of silica aerogel [8]. According to Xu et al. (2021), silica (SiO2) aerogel is a lightweight nanoporous amorphous solid material with very good fire and heat insulation performance. It has excellent properties such as low density, low thermal conductivity, high porosity, and high specific surface area. It is widely used in pipeline heat insulation, heat insulation coating, energy-saving glass, pipeline corrosion protection, adsorption catalysis, etc. [9]. In this study, the elastic silica aerogel gel based on SEM analysis was studied to provide support for the preparation of silica aerogel gel.

2. Cognition and Characteristics of Elastic Silica Aerogel

2.1. Cognition of Elastic Silica Aerogel. Aerogels (aerogels) are often referred to as lightweight nanosolid materials that form a nanoporous network structure by aggregating nanoscale ultrafine particles and filling the network pores with gaseous dispersion media. Aerogels gel are a solid, but 99% of them are composed of gas. Their appearance is semitransparent and looks like solid smoke. Liu et al. (2014) studied the effect of agitation and acetic acid curing on the morphology of silica aerogel prepared by ultrasonic assisted sol-gel method using tetraethyl orthosilicate as raw material based on SEM analysis. The analysis shows that the structure of silica aerogel prepared without stirring is not easy to collapse when ammonia is added, and the nanosilica aerogel prepared by acetic acid curing has uniform particle distribution [10]. According to Ma et al. (2020), silica aerogel gel shows excellent performance with its unique nanopore structure, which can be used in more fields to optimize the structure and performance of aerogel gel. The composite silicon source can introduce hydrophobic and functional groups, so as to improve the structural properties of silica aerogel and optimize the preparation process [11]. Li et al. (2012) used tetraethyl orthosilicate as raw material, first prepared wet gel by sol-gel method, then soaked in reaction solution for aging, then used n-hexane for solvent exchange and trimethylchlorosilane for surface modification, and finally obtained light porous silica aerogel [12]. According to Li et al. (2012), silica aerogel is a typical nanoporous lightweight material with unique properties. The research on the silicon source, solvent, preparation process selection, and catalyst in the preparation of gel is conducive to the production of silica aerogel [13]. Silica aerogel is widely used in various fields because of its three-dimensional porous network structure, low density, light weight, and large specific surface area. The unique structure is shown in Figure 1.

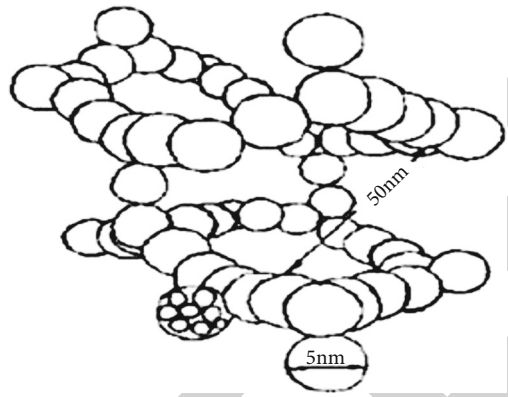

Figure 1: Structure of silica aerogel.

As shown in Figure 1, silica aerogel has a porous structure and primary particles with a diameter of about 3-8 nm cluster with each other to form its skeleton. Because of its unique three-dimensional structure, it has a series of extraordinary properties.

2.2. Characteristics of Elastic Silica Aerogel. Elastic silica aerogel gel is a kind of lightweight nanoporous amorphous solid material with good thermal insulation performance. Based on the characteristics of the material itself, aerogel gel materials have broad application potential in thermal, acoustic, optical, microelectronics, and particle detection. Its main characteristics are thermal insulation, which will not decompose or emit harmful gases even at a high temperature of 800°C. It is a green and environment-friendly material, so it is widely used in industry, construction, aerospace,

Table 1: Overall effect analysis of preparation of elastic silica aerogel under different methods (%).

Grouping	Scanning speed	Working distance	Imaging resolution	Accuracy of results
Traditional method	72.65	75.26	76.58	78.28
SEM analysis	94.32	93.21	94.28	93.65
T	6.315	6.452	6.268	6.386
P	0.046	0.038	0.043	0.037

and other fields. Secondly, the sound insulation is good. Due to the low sound velocity characteristics of silicon aerogel, it can achieve the effect of high-temperature sound insulation. Nonlinear optical properties: due to the formation of quantum dot structure in the nanonetwork of silica aerogel, strong light emission can be observed. Therefore, using the structure of silicon aerogel and the nonlinear optical effect of C60, new laser protective glasses can be further developed. It can also be used as a new type of gas filtration. The material has uniform pore size distribution and high porosity. It is an efficient gas filtration material.

3. Routine Analysis Method for Preparation of Elastic Silica Aerogel

Silica aerogel has many excellent characteristics, such as large specific surface area, high porosity, small pore size, and controllable bulk density. It is mainly used in the fields of electronic equipment, aerospace, building energy conservation, biomedicine, and so on. There are many silica analysis methods, among which the high content of silica mainly includes potassium fluorosilicate volumetric method, primary hydrochloric acid dehydration plus colorimetry, and hydrofluoric acid direct volatilization. Among them, the volumetric method of potassium fluorosilicate has many determination conditions and many influencing factors. The primary hydrochloric acid dehydration plus colorimetry requires cumbersome filtration and colorimetric process. The direct volatilization of hydrofluoric acid has a low adaptation range, and the low content will affect its accuracy. In the analysis method based on SEM, as long as the preparation of silica aerogel pattern is simple, the block or powder, conductive or nonconductive pattern can be directly put into SEM for observation with little or no treatment.

4. SEM Analysis Method and Advantages of Preparation of Elastic Silica Aerogel

4.1. SEM Analysis. SEM is an electron microscope developed after transmission electron microscope (TEM). The imaging principle of SEM is different from that of optical microscope or transmission electron microscope. It takes electron beam as the illumination source, irradiates the focused electron beam on the sample in the form of grating scanning, generates various information related to the properties of the sample, and then collects and processes it to obtain the enlarged image of micromorphology. It is characterized by high instrument resolution, image depth of field, three-dimensional feeling, simple sample preparation, and com-

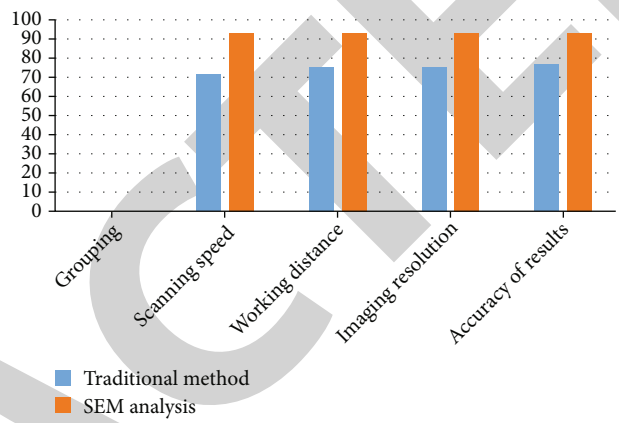

Figure 2: Overall effect visualization of preparation of elastic silica aerogel under different methods.

Table 2: Comprehensive performance analysis of elastic silica aerogel prepared by different methods (%).

Comprehensive analysis	Traditional method	SEM analysis
Convenience	72.42	91.56
Security	74.65	94.38
Entirety	73.28	92.36
Efficiency	72.32	91.42
Practicability	71.62	94.26

prehensive analysis. Digital analysis is the most basic skill in SEM. There are four common methods: trend analysis method, also known as comparative analysis method, and horizontal analysis method. It mainly carries out base comparison or month on month comparison through the same index or ratio of continuous data to obtain their change direction, amount, and amplitude, so as to perceive the overall trend. There are mainly analysis latitude: sometimes segment trend, daily trend, weekly trend, monthly trend, and seasonal trend! This analysis method is relatively simple. Generally, these trends can be mastered through Baidu Index and Baidu statistics. The key point is to adjust the advertising strategy according to the trend of different time according to their own industry, which is basically the data analysis logic from receiving a project to specific optimization measures. The proportion analysis method refers to a method of summarizing the same thing into several items, calculating the proportion of each component in the total, and analyzing the proportion relationship between the part

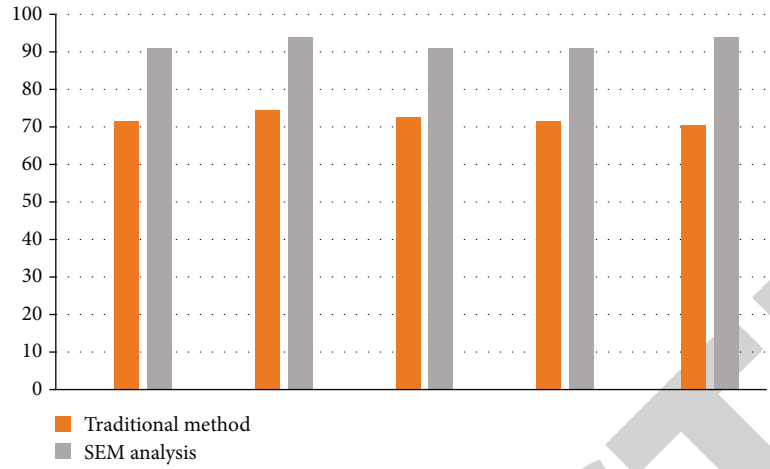

Figure 3: Visualization of comprehensive properties of elastic silica aerogel prepared by different methods.

and the total. The application of SEM is helpful for SEMER to quickly grasp the core promotion business, main promotion channels, main promotion regions, and other major contributors of the enterprise. Top n analysis refers to the top n summary based on data, which is compared with other summary data to obtain the proportion of the most important data and data effect. The application in SEM is similar to the 28 principle. Find the data with consumption/effect accounting for 80% to effectively help locate the problem. Otherwise, too much data will complicate the problem. Second, locate the important keywords that need to pay continuous attention to consumption or transformation. The four quadrant analysis method, also known as the matrix analysis method, refers to the use of two reference indicators to cut the data into four small blocks, so as to cut the disordered data into four parts, and then carry out targeted analysis for each small block of data.

4.2. SEM Analysis of Advantages of Preparation of Elastic Silica Aerogel. The main advantage of SEM analysis in the preparation of elastic silica aerogel is that it can observe the results of the preparation of silica aerogel stereoscopically, multilayered, and accurately. This multilevel causality is more in line with the real form of human thinking, which cannot be achieved by traditional regression analysis. According to the abstraction degree of different attributes, SEM divides the attributes into multiple layers for analysis. Second, SEM analysis can include attributes that cannot be measured directly into the analysis. It can directly observe the rough surfaces of metals and ceramics with large fluctuations, so as to expand the scope of data analysis, especially suitable for some abstract inductive attributes. Moreover, the preparation of SEM sample is simple. Only a small piece or powdery, conductive, and nonconductive sample can be observed directly without treatment or a little treatment, and the image can be closer to the real state of the sample. Moreover, SEM analysis can quantify the causal relationship between various attributes, so that they can be compared at the same level. At the same time, the same model can also be used to compare various market segments or competitors.

Table 3: Analysis of coupling degree of preparation of elastic silica aerogel by different methods (%).

Grouping	Coupling degree	
	Before use	After use
Traditional method	72.42	78.36
SEM analysis	84.28	95.64
t	7.428	7.126
P	0.042	0.038

5. Simulation Verification

5.1. Overall Effect Analysis of Preparation of Elastic Silica Aerogel under Different Methods. Based on the structural characteristics of porous network framework of elastic silica aerogel, it has certain requirements and difficulties for the research theory of preparation, so it is necessary to use professional analysis and observation methods to study it. Therefore, the preparation technology of elastic silica aerogel is comprehensively analyzed from four aspects of scanning speed, working distance, imaging resolution, and result accuracy according to two different methods, and the following Table 1 is obtained.

In Table 1, through the overall effect data of the preparation of elastic silica aerogel under different methods in the above table, it is obvious that the preparation of elastic silica aerogel gel analyzed by SEM is more conducive to the preparation results of silica aerogel gel, with higher data accuracy and more practical value.

In order to better compare the overall effect of the preparation of elastic silica aerogel under different methods, the visualization is carried out according to the data in Table 1, and Figure 2 is obtained.

As shown in Figure 2, it shows the overall effect visualization of the preparation of elastic silica aerogel under different methods. It is obvious that there is a huge gap between the SEM analysis method and the traditional method. Thus, it can be seen more intuitively that the overall effect has higher practical value, and the prepared data are more

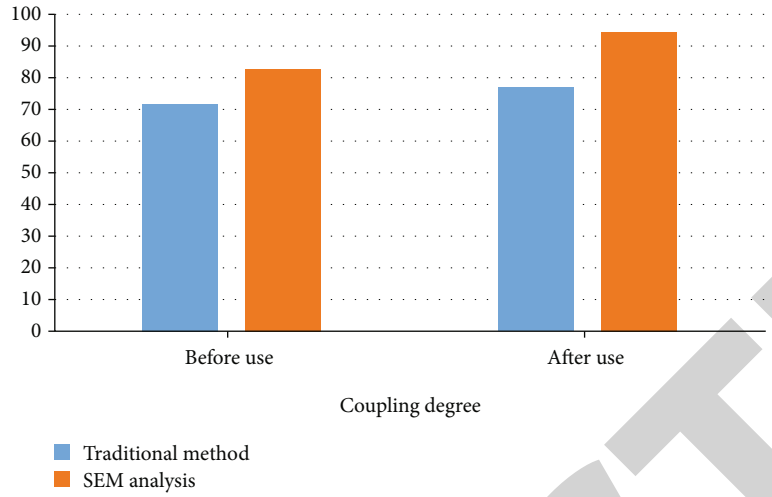

Figure 4: Visualization of coupling degree of preparation of elastic silica aerogel under different methods.

accurate. Therefore, it can be seen that the progress of the times and the continuous innovation of technology are reflected in the preparation of elastic silica aerogel.

5.2. Comprehensive Performance Analysis of Preparation of Elastic Silica Aerogel under Different Methods. With the rapid development of computer science and technology, scientists are tirelessly carrying out research and development of many technologies. Due to the unique structure and unique characteristics of elastic silica aerogel, it is widely used and developed. Therefore, the preparation of silica aerogel gel has also attracted special attention. According to two different methods, from convenience, safety, efficiency, integrity, and practicability, the preparation of elastic silica aerogel is comprehensively analyzed, and the following Table 2 is obtained.

Table 2 shows the comprehensive performance data of the elastic silica aerogel gel prepared by different methods. In each performance, it can be seen that the SEM analysis method is significantly better than the traditional method, ensuring the accuracy and work efficiency of the preparation data.

In order to better evaluate and compare the preparation of elastic silica aerogel under different methods, the visualization is carried out according to the data in Table 2, and Figure 3 is obtained.

As shown in Figure 3, it shows the visualization of the comprehensive performance evaluation of the preparation of elastic silica aerogel under different methods. It is very intuitive to see that SEM analysis method can better analyze the preparation results of elastic silica aerogel. It can not only observe the prepared samples in a more three-dimensional and multilevel way, so that they can provide more accurate detection results, but also indirectly illustrate the practicality, efficiency, and three-dimensional visualization of SEM analysis method. It provides a theoretical basis for the preparation of elastic silica aerogel.

5.3. Analysis of Coupling Degree of Preparation of Elastic Silica Aerogel under Different Methods. As the characteristics of elastic silica aerogel are well known, the material should be widely used in various fields. Therefore, the preparation of elastic silica aerogel gel must also be widely concerned. The preparation of elastic silica aerogel gel is analyzed and observed by SEM analysis method, and the accurate data and scientific and effective experimental results are obtained, which provide theoretical and technical support for the preparation of elastic silica aerogel. Now, the coupling degree of preparation of elastic silica aerogel is analyzed according to two different methods, and the following Table 3 is obtained.

Table 3 shows the comparison of the coupling degree data of the traditional method and SEM analysis method used for the preparation of elastic silica aerogel. It is obvious that the coupling degree data results of the silica aerogel prepared by SEM analysis method are better than those of the traditional method, and the coupling degree data of the two different algorithms are $t < 10$, $P < 0.05$, which is statistically significant.

In order to better compare the coupling degree of the preparation of elastic silica aerogel under different methods, the visualization is carried out according to the data in Table 3, and Figure 4 is obtained.

As shown in Figure 4, it shows the visualization of the coupling degree of the preparation of elastic silica aerogel under different methods. It is very intuitive to see that the coupling degree of SEM analysis method in the preparation of elastic silica aerogel gel is better, and the mutual fusion effect of the coupling degree is also better, which is conducive to maximizing the efficiency and benefits of the preparation of elastic silica gel.

6. Summary

Silica aerogel gel is one of the most common aerogels gel. It is a lightweight nanoporous amorphous solid material with excellent thermal insulation performance. It is precisely because of these characteristics that aerogel gel materials have broad application potential in thermal, acoustic,

optical, microelectronics, and particle detection. Based on the comparison between traditional methods and SEM analysis, this study analyzes and studies the preparation of elastic silica aerogel from the overall effect, comprehensive properties, and coupling data of the preparation of elastic silica aerogel gel. Through comparison and statistical methods, it is finally shown that the research conclusion of the preparation of elastic silica aerogel analyzed by SEM has a deep impact on various fields. Due to the unique structural characteristics of elastic silica aerogel and the complex porous network skeleton, the preparation method of silica aerogel has certain difficulties and professional technical requirements. Moreover, the structure theory of silica aerogel gel is also confirmed by SEM analysis. According to the characteristics of thermal insulation, sound insulation, filtration, and catalysis of silica aerogel, it has a wide application prospect in many aspects and optimizes the structure of aerogel gel to improve the high quality of aerogel gel. It is also one of the current research focuses to develop new preparation processes to reduce the preparation cost of aerogel gel as much as possible. With the in-depth understanding of it and the improvement of its preparation process, several characteristics of elastic silica aerogel have been widely used in industrial, civil, aerospace, and migrant fields and now occupy an irreplaceable position, thus driving the rapid development of national economy and technology.

Data Availability

The data underlying the results presented in the study are available within the manuscript.

Conflicts of Interest

There is no potential conflicts of interest in our paper.

Authors' Contributions

All authors have seen the manuscript and approved to submit to your journal.

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