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Role of Nanotechnology in Chemical Engineering

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Abstract

Scientists and engineers have focused their research in recent years on the creation of nanomaterials and their applications in several fields. Nanoparticles are used in a wide variety of fields, including engineering and medicine. Nanoparticles can be used in environmental applications as well. Nanomaterials have unique features as a result of their small size.

They are excellent catalysts due to their large surface area. Catalysts, sensors, coatings, adsorption, and drug delivery are some of the most common chemical engineering applications. Despite the numerous benefits, the most important task is to prepare and maintain the right size of nanomaterials. Chemical engineers are critical to the advancement of nanomaterials. The purpose of this paper is to explain the various nanomaterials, their applications, and their preparation processes. In this overview, the outcomes of numerous patents and research publications have been summarised.

Keywords

Nanoparticles; Chemical Engineering; Catalyst

Introduction

Functional nanoparticles are produced in large quantities by the chemical industry. These nanoparticles can be found in a variety of items, including paints, daily home formulas, and automotive additive mixes. However, the word "chemical industry" is broad, and enterprises in this sector can make anything from smart electronics to food. Many polymers are made in the chemical sector, but they nonetheless belong within the nanotechnology umbrella especially since many products are adjusted at the nanoscale, even if the material isn't designated a "nanomaterial." Many well-known polymers, such as Kevlar® and Teflon®, were developed by companies like DuPont and have some nanotechnology effect. Sunscreen is one formulation that has been impacted by nanotechnology. Companies like Oxonica have teamed up with Croda to develop sunscreen formulas that use UV absorber materials to bridge the gap between nanotechnology and the chemical sector. Catalysis is widely utilised in the chemical industry to speed up processing and reaction times, and nanoscale catalysts and catalytic surfaces have recently offered significant improvements to many sections of the chemical industry. It takes a lot of effort to design new and efficient catalysts, and new advances are frequently realised through industry-university cooperation, such as the one that exists between the two institutions. For many years, BASF has been a global leader in the chemical business, and some of its completed products have been inspired by nanoscale processes seen in nature. The Lotus Spray is a perfect example of this. Because the surface of the Lotus plant's leaf has a superhydrophobic surface that repels water completely, the Lotus spray is based on it. The Lotus spray has subsequently grown in popularity as a leading water-repellent spray that can be used on a variety of surfaces.

Conclusion

Now we'll go on to the processing stage. It's no secret that the chemical industry's different processing techniques are at the heart of the creation of the items we buy. Membranes, a product of nanotechnology, have entered this sector of the chemical industry. Various nanoscale membranes have been developed for use in carbon capture technologies that provide greener processes, water desalination and purification, and the purification and manufacturing of chlor-alkali chemicals, however you may not see this in action in the products directly. Selective separations employing metal organic frameworks could be a future technique in the chemical industry (MOFs). MOFs have long been developed in academic laboratories, but their economic potential is only now becoming apparent. However, if this technology becomes more widely available, it might have tremendous ramifications for the entire petrochemical sector.

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