

機能性単分散無機微粒子の大量液相合成とその応用

Large-Scale Liquid Phase Synthesis of Functional Monodispersed Inorganic Fine Particles and Its Applications

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Abstract

Synthesis methods of functional inorganic particles, excluding the pulverization one, can be divided into gas and liquid phase ones. The former one includes, for example, a method in which a metal salt solution is sprayed and a hydrolysis reaction occurs in the gas phase to cause condensation and growth to give an aerosol oxide. On the other hand, liquid phase methods are generally at a practical level. They are often used, in particular, for synthesizing oxide fine particles. In this method, a hydrolysis reaction occurs in a liquid phase to obtain the desired oxide nanoparticles, and the reaction is mainly a solid phase precipitation reaction from a solution. This article provides a detailed explanation of liquid phase procedures, focusing on the Sol-Gel and Gel-Sol methods. That is, we will introduce the so-called Sol-Gel method of silica nanoparticle synthesis using alkoxides as a starting material, as typified by the Stöber method. Next, an overview of the Gel-Sol method will be given, where it is a completely original and novel particle synthesis method developed by us. As an example, details of formation mechanism, obeying Gel-Sol method for synthesizing uniform titania nanoparticles as a photocatalyst, will be explained. Then, we will also introduce the basic concept and application of monodispersed nanoparticles of ITO (indium tin oxide), a transparent conductive oxide, to synthesis methods.

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1. はじめに

機能性無機微粒子の合成手法は粉碎法を別にするると気相法と液相法に分かれる。気相法は、

たとえば金属塩溶液を噴霧させて気相中で加水分解反応を起こして凝結・成長させて、エアロゾル酸化物を得る方法がある。一方、液相法は概ね実用化レベルにあり、特に酸化物微粒子合

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