BEYOND NANOSILICA: GEOPOLYMERIC NANOALUMINOSILICATES FOR FUNCTIONAL NANOCOMPOSITES

Dong-Kyun Seo, Arizona State University
dseo@asu.edu
Shaojiang Chen, Arizona State University
Wenwen Zhang, Arizona State University

Key Words: Geopolymer, Nanozeolites, Sustainability, Aluminosilicates, Nanocomposites

Nanoaggregates such as nanosilica and carbon black are two of the most important inorganic nanomaterials used in modern technologies including nanocomposites. By using sustainable geopolymer chemistry, we introduce new aluminosilicate nanoaggregates and nanostructured zeolites which may become as important as the aforementioned materials in nanocomposites, with their own unique functionalities. Geopolymer has been extensively studied and utilized as “green cement” in addressing global warming issues, one of the most challenging problems in human sustainability. At the same time, it is one of the few inorganic material systems that can be produced in a large scale and thus has a potential to meet the demand of large-scale applications. We will describe the nature of the sustainable, scalable production methods and discuss the key features of the materials including morphologies, surface areas, porosity, aggregate size, and zeolitic crystallinity. The nanostructured zeolite products demonstrate the “nano” effect of their own, in terms of the short diffusion lengths within individual crystals and of the high surface area. Examples of their superior performances will be given for their applications in their neat form. Expansion of the original synthetic method has allowed organic-modified nanoaluminosilicates with increased hydrophobicity which can be important in nanocomposite fabrication.