IMMENSE POTENTIAL OF GEOPOLYMERIC NANOMATERIALS FOR SUSTAINABILITY APPLICATIONS

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Geopolymer has been extensively studied and utilized as “green cement” in addressing global warming issues, one of the most challenging problems in human sustainability. It is one of the few inorganic material systems that can be produced in a large scale and thus has a potential to truly address such large-scale problems. In connection to the innate “nano” properties of geopolymer materials, we present some of our new progresses in the pursuit of new geopolymeric aluminosilicate nanomaterials and their sustainability applications. We will first briefly describe syntheses and properties of three different types of the new nanomaterials (Figure 1) and will illustrate their uses. For example, nanoporous geopolymer materials could be produced and used as an excellent arsenic absorbent for ground water purification and as a highly effective biodiesel catalyst. High-structure geopolymer nanoaggregates can be synthesized with controlled zeolicity for polymer nanocomposite applications with excellent energy-saving performances. Highly-crystalline hierarchical zeolites have been discovered to show an exceptional CO_2 capacity, sorption kinetics, selectivity and regeneration capability essential for cost-effective CO_2 separation. Superior ion exchange kinetics of the material has been observed for silver-ion zeolite with a superb antibacterial efficacy against antibiotics-resistant MRSA bacteria. Their out-of-the-lab usages are currently being realized in industry with future goal of megatonic production.

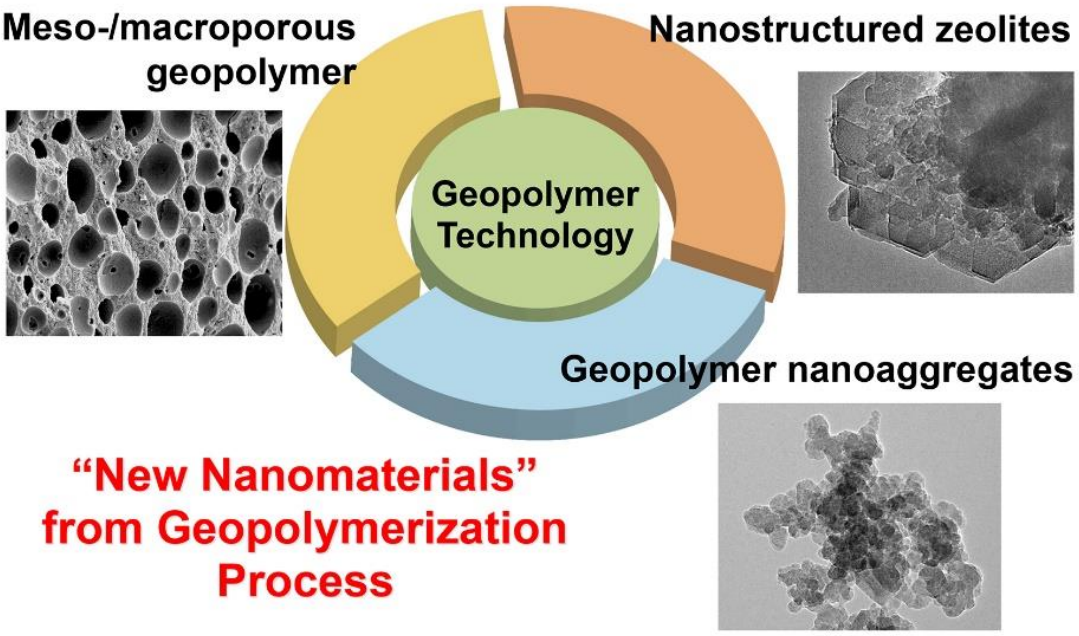

Figure 1. Three different types of aluminosilicate nanomaterials produced through geopolymerization process.