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Functional metal-ceramic nanocomposite based on tubule clay

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Halloysite is aluminosilicate tubular clay with diameter of 50 nm, inner lumen of 15 nm and length of 600-900 nm. Halloysite tubes are formed by rolling of aluminosilicate sheets. It is a natural biocompatible nanomaterial available in thousands of tons at low price which makes it a good candidate for nano architectural composites. Halloysite nanotubes are a promising meso-porous media for catalytic nanoparticles which may be seeded on the tube surface or synthesized exclusively in the tube lumen, providing enhanced catalysis, especially at high temperatures. Core-shell materials based on abundantly available halloysite clay nanotubes with efficient loading with heavy metal ions through Schiff-base binding were developed. This allowed for synthesis of Ru, Rh, Co or Ag nanoparticles at selected positions in the tubes either on the outside surface or inside lumens and in the multilayer wall voids. The two-step in situ synthesize of Ru and Ag nanoparticles inside halloysite nanotubes allowed for ca. 90% intercalated tubule product with metal particles' diameter of 3-5 nm. These metal-ceramic nano composites have high surface area providing a good support for catalysis and can be also used for adsorption of metal ions from water. The ease of manufacturing of this novel, green, scalable products proves its capability to respond to the demands of increasing catalytic efficiency along with keeping our environment safe.

Biography

Yuri Lvov is a Professor and eminent Endowed Chair of Micro-Nanosystems at Louisiana Tech University. He is an expert in "Nanocomposites, drug nanocapsules, clay nanotubes for controlled release of chemicals". He has 14 US patents, edited four books, published 240 papers with citations 17,000.

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