conferenceseries.com

J Material Sci Eng 2019, Volume 8
DOI: 10.4172/2169-0022-C1-126

17th International Conference on

Emerging Materials and Nanotechnolgy

March 07-08, 2019 | Berlin, Germany

Halloysite - interfacial self-assembly with clay nanotubes: Organized arrays and core-shell metalloceramic systems

Yuri Lvov[1], **Weimin Du**[1, 2], **Vladimir Vinokurov**[1, 3], **Anna Stavitskaya**[3], **Alexandr Glotov**[3] and **Andrei Novikov**[3]

[1]Louisiana Tech University, USA

[2]Anyang Normal University, China

[3]Gubkin Russian State University of Oil & Gas, Russia

The author describe self-assembly of natural clay nanotubes in functional arrays to produce organized organic/inorganic heterostructures. These halloysite nanotubes are biocompatible and non-toxic, which is logical considering millions of years that living organisms coexisted with clays. Halloysite allows for 10-20 wt.% chemicals/drug loading into the inner lumen and gives an extended release for days and months after applications (anticorrosion, self-healing, flame retardant and antibacterial composites). The structured surfaces of the oriented nanotubes enhance the interactions with biocells by improving the rate at which they are captured as well as inducing differentiation in stem cells. An encapsulation of biocells with halloysite enables continual control of the microorganism's growth and proliferation. This approach was also developed for petroleum spill bioremediation as a synergistic process with pickering oil emulsification. Quantum dots immobilized into the clay nanotubes were employed for cell labeling and imaging.We selectively produced 1-3 nm diameter metal particles (Au, Ag, Co, Ru, Fe_2O_3, ZrO_2 and CdS) inside or outside of these aluminosilicate nanotubes, thus optimizing the catalysis. The catalytic hydrogenation of benzene, phenol, hydrogen production and impacts of the core-shell architecture, as well as the metal particle size and seeding density were optimized for high efficiency processes, exceeding the competitive industrial formulations. The auto exhausting Cu-Ni / halloysite systems has shown a high efficiency at 400°C, demonstrating temperature stabilization of the catalyst encased in the nanotubes. These core-shell mesocatalysts are based on a safe and cheap natural clay nanomaterial and may be scaled-up for industrial applications.

ylvov@latech.edu

Notes: