19<sup>th</sup> International Conference on

## NANOTECHNOLOGY AND EXPO

November 13-14, 2017 | Atlanta, USA

## Architectural core-shell metal catalyst synthesis onto/into clay nanotubes

Y Darrat<sup>1</sup>, A Stavitskaya<sup>2</sup>, V Vinokurov<sup>2</sup>, C Colletti<sup>3</sup>, J McDonald<sup>1</sup> and Y Lvov<sup>1</sup> <sup>1</sup>Louisiana Tech University, USA <sup>2</sup>I M Gubkin Russian State University of Oil and Gas, Russia <sup>3</sup>Palermo University, Italy

The efficiency of catalysts could be increased, first, by decreasing the size of the catalyst particles to nanoscale. Secondly, catalysts need a support mesoporous material for aggregation prevention and scale up. It is rather difficult to support few-nanometer sized catalytic particles. Halloysite clay nanotubes were used for this purpose. Halloysite nanotubes are formed by rolling kaolin aluminosilicate sheets up to 10-15 revolutions. They have a diameter of 50-60 nm, a lumen of 12-15 nm and a length of 500-800 nm. They are environmentally friendly, natural, inexpensive and available in large quantities (thousands of tons.) Metal nanoparticle catalysts could be selectively attached to the nanotube outer surface, the lumen, or in between the layers and such core-shell metal/ ceramic composites could be synthesized on a large scale in industrial reactors, for a number of applications such as Fischer-Tropsch gas-diesel catalysis. In order to enhance metal adherence to halloysite, the nanotubes were intercalated with furfural which was then converted to tetradentate ligands which have shown specific binding for aqueous Ru, Pt, Pd, Ni and Cu ions at elevated temperatures. As a result, metal ions were able to attach to halloysite after reduction with NaBH<sub>4</sub>. Metal particles of 2-5 nm were formed both in the central lumen and in the interlayer space of the tube walls. This development could have many related potential applications.

## Biography

Y Darrat is a PhD student at Louisiana Tech University in the Institute for Micromanufacturing, pursuing a degree in Micro and Nanoscale Engineering. He has graduated from LaTech with a Bachelor's degree in Nanosystems Engineering.

yad003@latech.edu

Notes: