

# 2<sup>nd</sup> World Chemistry Conference

August 08-10, 2016 Toronto, Canada

## The effect of hydrogen and chemical treatments of activated carbon in the synthesis of ammonia on the promoted ruthenium catalyst

Naghi Saadatjou<sup>1</sup>, Ali Jafari<sup>2</sup> and Saeed Sahebdehfar<sup>2</sup><sup>1</sup>Semnan University, Iran<sup>2</sup>Petrochemical Research and Technology Company, Iran

In this work, the activated carbon without any treatment (AC), AC with hydrogen treatment at 900°C for 24h (ACH) and ACH with HNO<sub>3</sub> treatment at 90°C for 5h in the reflux system (ACHN) were used as a support for ruthenium catalyst. They were impregnated by RuCl<sub>3</sub>, Ba(NO<sub>3</sub>)<sub>2</sub> and KOH solutions, then were reduced by H<sub>2</sub> at 400°C for 4 h. They were used as ammonia synthesis catalyst. The physical and chemical properties of catalyst samples were characterized by applying nitrogen adsorption/desorption, TEM, SEM, EDS and XRD methods. The ammonia synthesis activity was evaluated in the fixed-bed reactor set-up under near-commercial operating conditions (that is, T: 400-450°C, P: 30 bar, H<sub>2</sub>/N<sub>2</sub>:3/1). It was found that the treatment of activated carbon support with hydrogen (ACH) and hydrogen/HNO<sub>3</sub> (ACHN) significantly enhanced both activity and stability of catalysts although the textural properties little influenced. According to the support type, the order for both activity and stability was ACHN>ACH>AC. The best performance was obtained for K-Ba-Ru/ACHN sample due to the removal of chlorine and sulfur impurities and formation of oxygen-containing surface functional groups after hydrogen and HNO<sub>3</sub> treatment of AC support that resulted to good dispersion of Ru and promoters. The reaction was found not to be intra-particle diffusion limited. A second order rate expression was proposed for deactivation kinetics of the catalysts and numerical values of 0.016 and 0.0018 h<sup>-1</sup> were obtained for rate constant of deactivation of K-Ba-Ru/ACH and K-Ba-Ru/AC catalysts, respectively.

### Biography

Naghi Saadatjou has completed his PhD from University of Leeds (UK) and worked in Petro-Canada Lubricants R&D, Mississauga, Canada as a Research Chemist. He is now Senior Researcher, Professor of Applied Chemistry and Director of a research team focusing on Petrochemicals and Polymers at Semnan University and Petrochemical Research and Technology Company, Iran. He has published more than 50 papers in reputed journals and serving as an Editorial Board Member of some related journals.

[nsaadatjou@semnan.ac.ir](mailto:nsaadatjou@semnan.ac.ir)  
[naghisjo@gmail.com](mailto:naghisjo@gmail.com)

### Notes: