

Petroleum Sludge Valorization via Pyrolysis: Modelling and Experimental Studies

Jianbing Li¹, Beidou Xi²

¹School of Engineering, University of Northern British Columbia
3333 University Way, Prince George, British Columbia, Canada V2N 4Z9

Jianbing.Li@unbc.ca

²State Key Laboratory of Environment Criteria and Risk Assessment, Chinese Research Academy of Environmental Sciences, Beijing 100012, China

xibd@craes.org.cn

Petroleum sludge is a typical solid waste generated in the oil and gas industry. It contains a variety of hazardous substances such as polycyclic aromatic hydrocarbons (PAHs) and toxic metals, and the improper handling of sludge may cause adverse environmental effects. Meanwhile, petroleum sludge represents a recyclable resource due to its high oil and carbon contents. Given such dual characteristics, pyrolysis presents a viable approach for transforming this hazardous waste into valuable products. However, many technical challenges and limitations still exist in petroleum sludge valorization. In this presentation, the main methods used for petroleum sludge valorization will be reviewed, with an emphasis on waste pyrolysis. A machine learning based modeling approach is introduced to predict and optimize the sludge pyrolysis process, and a co-pyrolysis method with wood waste is examined through a series of laboratory experiments to investigate its oil recovery and heavy metal immobilization efficiency. Experimental studies are also introduced to examine the utilization of pyrolysis char as an effective adsorbent for heavy metal remediation and oil/water separation. The results indicate that the sludge pyrolysis holds great potential to be used for waste valorization practices.