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Nanosweet: Nanostructured composites of graphene/metal oxides for effective natural gas sweetening

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Natural gas well streams often contain undesirable contamianats such as hydrogen sulfide (H_2S), carbon dioxide (CO_2), mercaptans (RSH) etc. and termed as acid gases. In addition to their offensive odor and high toxicity, acid gases can cause serious corrosion problems due to their acidic nature and may reduce the efficiency of gas treatment processes. Hence, removal of acid gases from natural gas is required not only to comply with both progressively tighter product specifications and stricter environmental regulations, but also to reduce their impact on processing of natural gas. In the present work, it is proposed a new adsorption process that involves hybridization of selected nanosized metal oxides (NMOs) supported on carbonaceous graphene. This combination allows for efficient adsorption due to the very high surface area of graphene and high reactivity of NMOs. A series of hierarchical nanostructures of graphene with selected NMOs, e.g., copper oxide, zinc oxide and iron oxide were synthesized using in-situ hydrothermal process. The reaction involves in-situ crystal growth of NMOs with simultaneous reduction of graphene oxide to graphene. The structure and morphology of resulting nanohybrids have been analyzed by X-ray diffraction, transmission electron microscopy and Raman spectroscopy. The degree of NMO dispersion in graphene and its elemental compositions is characterized by scanning electron microscopy coupled with EDAX. The surface area is measured using BET analysis. Finally, the acid gas adsorption-desorption efficiency of resulting nanohybrids was measured using thermogravimetic analysis and break through analysis.

Biography

Sunil Lonkar is working as Research/Teaching Associate at The Petroleum Institute. He has completed PhD from University of Pune, Indiaand University of Blaise Pascal (Sandwich program), France. He performed his postdoctoral studies at IPF-Dresden, Germany and UMONS, Belgium. He has published more than 20 papers in repured journals and holds 1 patent.

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