

Department of Chemical Engineering Presents:



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Palladium Sorbents for High Temperature Capture of Mercury, Arsenic, Selenium and Phosphorus From Fuel Gas

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In gasification for power generation, the removal of mercury by sorbents at elevated temperatures preserves the high thermal efficiency of the integrated gasification combined cycle system. Unfortunately, most sorbents will display poor capacity for elemental mercury at elevated temperatures. Previous experience with sorbents in flue gas has allowed for judicious selection of potential high temperature candidate sorbents. The capacities of many sorbents for elemental mercury from nitrogen, as well as from different simulated fuel gases at temperatures from 400 - 700°F, were determined. The simulated fuel gas compositions contain varying concentrations of mercury, arsine, hydrogen selenide, phosphine, carbon monoxide, hydrogen, carbon dioxide, moisture, and hydrogen sulfide.

Palladium is an attractive sorbent candidate for the removal of mercury from fuel gases at elevated temperatures. Recent results suggest that palladium has excellent potential for arsenic, phosphorus and selenium capture from fuel gases, making it capable of multi-pollutant capture. A license agreement has been signed by the United States Department of Energy and Johnson Matthey for further development of the sorbents. The sorbents have recently removed nearly 100% of the mercury, arsenic and selenium from slipstreams of dirty syngas at 500°F during several extended exposures at a pilot gasification facility. Future research areas and sorbent development for trace metal capture from fuel gases will be discussed.

Bio Sketch

Evan J. Granite is a Research Group Leader at the Department of Energy's National Energy Technology Laboratory (NETL), and an Adjunct Research Associate Professor of Chemical and Petroleum Engineering at the University of Pittsburgh (volunteer position). Dr. Granite did postdoctoral research at the Department of Energy, received a PhD in Chemical Engineering from the University of Rochester, and BS and MS degrees in Chemical Engineering from The Cooper Union. His research has focused on mercury and carbon dioxide removal from flue and fuel gases. Dr. Granite is the principal or co-investigator for projects on the capture of mercury, arsenic, selenium and phosphorus from coal-derived flue and fuel gases, and oxygen and carbon dioxide separations from flue gas and air. He is the coauthor of thirty five peer-reviewed journal articles, eight patents/patents pending, one hundred seventy five conference papers and presentations, and forty nine DOE reports of invention. Evan currently serves on the PhD thesis committees for students at Stanford and West Virginia University. His research interests are in separation technologies, pollution clean-up, catalysis and surface chemistry, photochemistry, electrochemistry, energy/utility systems, and capture, storage, and utilization of carbon dioxide.