Materials for Separation Technologies – Emissions and Energy Reduction Opportunities

W.T. Choate, S.A. Dillich, *BCS, Inc., Columbia, MD*

Separation processes are among the most energy-intensive operations in industry, crosscutting all manufacturing industries and accounting for approximately 4,500 trillion Btu/yr)—about 22% of all U.S. in-plant energy use. Innovations in separation technologies not only enhance productivity and competitiveness of U.S. industries, but also are critical for achieving the U.S. Department of Energy Office of Energy Efficiency and Renewable Energy's (DOE-EERE) industrial energy and waste reduction goals.

This presentation will highlight the results of a recent DOE-sponsored study that addresses opportunities for materials innovations for industrial separations. Focusing on the existing practices of the four largest energy-consuming industries (chemicals, petroleum refining, forest products, and mining); this study identified more than 240 TBtu/yr that could realistically be saved by developing new or advanced materials for low-energy intensity separation technologies. Recommendations for future materials R&D focus on materials for applications with large energy-savings potential:

- New materials for low-energy-intensity separation technologies (e.g., extraction, adsorption, absorption, and membranes) with greater performance (improved selectivity, stability, morphology, and ability to regenerate) and/or reduced cost to replace distillation and evaporation.
- Development of knowledge on how to incorporate these agents in stand-alone or hybrid separation systems.

Successful development of these technologies could lower separations energy consumption by 40 to 80 percent while reducing capital costs.