A Carbon Molecular Sieve Membrane-Based Reactive Separation Process for Pre-Combustion CO₂ Capture

Mingyuan Cao¹, Linghao Zhao¹, Dongwan Xu¹, Seçgin Karagoz², Patricia Pichardo², Richard J. Ciora, Jr.³, Doug Parsley³, Paul K.T. Liu³, Vasilios I. Manousiouthakis², and Theodore T. Tsostiss³

¹Mark Family Department of Chemical Engineering and Materials Science, University of Southern California; ²Chemical and Biomolecular Engineering Department, University of California; ³Media and Process Technology, Inc.

Technology Background
Adsorption-enhanced WGS membrane reactor (MR-AR) process for pre-combustion CO₂ capture

Advantages
- No syngas pretreatment required
- Improved WGS efficiency
- Significantly reduced catalyst weight usage requirements
- Efficient H₂ production, and superior CO₂ recovery and purity

Key Technology Components
Carbon Molecular Sieve (CMS) Membranes

Hydrotalcite (HTC) Adsorbent
Field-tested at NCCC

Co-Mo/Al₂O₃ Sour-Shift Catalyst
Reaction rate data generated and global kinetics model developed

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Lab-Scale Experiments
Membrane Reactor Studies
Lab-Scale Experimental Set-Up

Multi-Scale MR-AR Model for Process Scale-Up

Multi-Scale MR-AR Model for Process Scale-Up

Preliminary TEA - MR-AR IGCC Process Scheme

Field-Scale Study of the MR-AR Process

Uky-CAER Gasifier
MR-AR Skid