

Coatings
Corrosion
Fracture and Mechanical Testing
High Temperature Mechanical Properties
Hydrogen Production and Storage Materials
Hydrogen Separation Materials
Irradiation
Materials Validation
Microstructure and Physical Properties
Modeling
Neutron Radiography
Nondestructive Evaluation
Post-irradiation Examination
Synthesis and Processing of Novel Materials
Welding and Joining
X-Ray Radiography

Hydrogen Separation Materials

Capabilities/Facilities

Polymer synthesis and characterization laboratories, membrane formation, gas and liquid membrane permeability testing, chemical synthesis and catalysis, and computational modeling.

Materials

Polymer membranes, polymer-ceramic composite membranes, perovskites, zirconia, NASICON and ceria.

Scientific/Engineering Issues

Membrane utility/durability, molecular design, mechanisms of selective mass transport, polymer membrane degradation, defect chemistry and ionic conductivity.

Staff

F.F. Stewart, E.S. Peterson, M.T. Benson, M.K. Harrup, T.P. O'Holleran, and J.-F. Jue.

Recent Projects

- "Energy Saving Separations Technologies for the Petroleum Industry: An Industry-University-National Laboratory Partnership," DOE Office of Energy Efficiency and Renewable Energy, \$250K/year
- "Hydrogen Gas Getters," DOE Office of Environmental Management, \$200K/year
- "Membrane Separations for Industrial Waste Water," DOE Office of Energy Efficiency and Renewable Energy, \$100K/year

- "Thermally Optimized Membranes for Carbon Dioxide Separations," DOE Office of Fossil Energy, \$700K/year

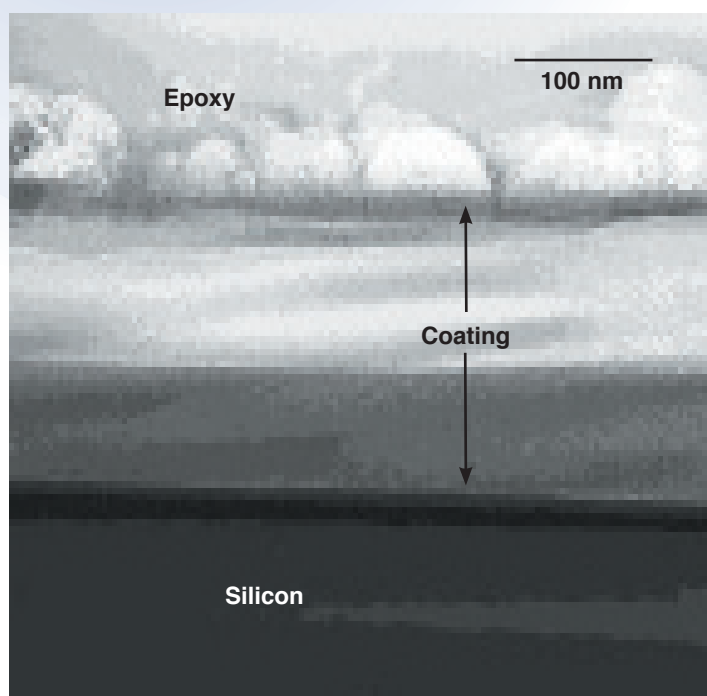
Collaborations

- INL/Los Alamos National Laboratory/Pall Corp., "Thermally Optimized Membranes for Carbon Dioxide Separations"
- INL/Colorado School of Mines/BP Aromatics, "Energy Saving Separations Technologies for the Petroleum Industry: An Industry-University-National Laboratory Partnership"
- Manuela Serban and Michele Lewis (Argonne National Laboratory-East), Brenden Boyle (University of Pennsylvania)

Publications

"Energy Saving Separations Technologies for the Petroleum Industry: An Industry-University-National Laboratory Research Partnership,"

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Bright-field TEM micrograph of a multiple coating of nanocrystalline ion-conducting ceramic film on silicon substrate.

science

INL
Idaho National
Laboratory

Continued from front

J.R. Dorgan, F.F. Stewart and J.D. Way, Technical Report DOE/ID-13998-final, March 28, 2003.

“Density Functional Investigation of Melamine-Formaldehyde Crosslinking Agents – Part 1: Partially Substituted Melamine,” M.T. Benson, *Industrial & Engineering Chemistry Research*, Vol. 42, p. 4147, 2003.

“Characterization of Gas Transport in Selected Rubbery Amorphous Polyphosphazene Membranes,” C.J. Orme, M.K. Harrup, T.A. Luther,

R.P. Lash, K.S. Houston, D.H. Weinkauff and F.F. Stewart, *Journal of Membrane Science*, Vol. 186, p. 249, 2001.

“Synthesis of Nanocrystalline NASICON-type Thin Film Ceramics”, P.A. Lessing and G. Huestis, Accepted by *Journal of Ceramic Processing Research*.

“Low Temperature Hydrogen Transport Using a Palladium/Copper Membrane”, P.A. Lessing, H.C. Wood, and L.D. Zuck, *Journal of Materials Science*, 38, p. 2401-2408, 2003.

For more information

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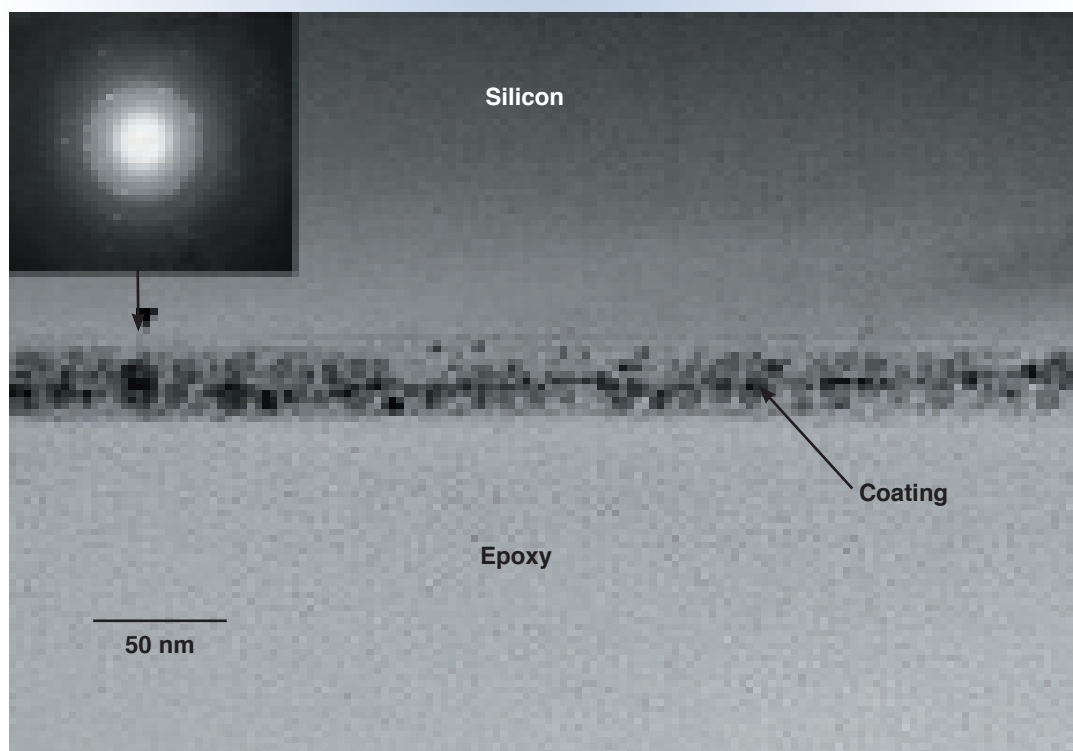
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TEM micrograph of a ceramic thin-film (~80 nm) coating on a silicon substrate. A selected area diffraction ring pattern is shown at the upper left.