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Nanomaterials and new technologies for oil and gas

Progress in development of advanced technologies for unconventional oil and gas production requires new materials stable at high pressures (~200 atm), temperatures (~250°C) and the ability to work in the presence of aggressive/corrosive environmental parameters including H₂S, H₂ and CO₂. Radical innovation related to new materials and a better understanding of metal corrosion effects occurring on material surfaces under high pressure and temperature are crucial. In addition, a better understanding of metal/liquid interaction will bring new insights on corrosion and will drive improvements in monitoring and protection. Those findings are necessary for successful design and modeling new functional materials for unconventional oil and gas. In this presentation, new insights adapting fundamental sciences to accelerate development of new technologies for unconventional oil and gas will be discussed. Developing a more fundamental understanding of metal/environment interactions will facilitate effective application of new monitoring technologies leading to enhanced operational safety and reliability. This lecture focuses on methodologies to develop new oil and gas technologies through physics, chemistry and materials science. The presentation will also provide an overview of corrosion/materials characterization work conducted at Honeywell's state-of-the-art corrosion lab in Houston, Texas. A few examples of Honeywell's corrosion and materials-related work include:

- develop new functional materials - sensors, proppants, separation membranes and catalysts,
- improve energy efficiency – process and corrosion monitoring,
- corrosion testing under high pressure and temperature by electrochemical methods, and
- processes monitoring in situ and real time by optical spectroscopy

Biography

Igor Kosacki is currently an Engineering Manager, Corrosion Solutions at Honeywell International Inc. In his current role, he is responsible for the operation of Corrosion Solution Laboratory and the development new research program for oil and gas materials. He received his PhD in Physics from the Institute of Physics Polish Academy of Sciences, Warsaw, Poland. In 1992, he joined the Crystal Physics and Electroceramics Laboratory at Massachusetts Institute of Technology, where he worked as Visiting Professor. During 1995-2001, he was employed by University of Missouri-Rolla as Associate Professor. Next, he was working at Oak Ridge National Laboratory (2001-2006) and Shell Exploration & Production (2006-2013) as Senior Scientist. He recently joined (since July 2013) Honeywell. His research activity is focused on the processing of advanced functional materials for energy and oil and gas technologies. The area of interest includes ceramics, thin films and nanocrystalline structures and the study of their electrical, structural and optical properties related to microstructure and fabrication. He is an active Member of Materials Research Society, The American Ceramic Society, as well as, NACE. He has been involved as a Member of the number conference advising committees and served as the Chairman for various symposia. He has widely published and has over 100 technical papers including book chapters and review articles in the area of materials research.

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