Igor Kosacki, J Material Sci Eng 2017, 6:10 (Suppl)
DOI: 10.4172/2169-0022-C1-087

Igor Kosacki

Honeywell International, Inc., USA

Nanomaterials for energy applications

Global energy demand is projected to rise as high as 60% over the next 30 years. It is a challenging trend that may be met only by revolutionary breakthroughs in energy science and technology. To achieve this goal, the efforts in areas including exploration new fossil resources, developing renewable energy and improving energy efficiency are needed. Developing advanced energy technologies requires more applied research; therefore progress in basic science has a vital role to play in this process. It is creative linkages between basic research and applied technology development where radical innovation is very crucial. Materials science has been identified as key across a range of technologies including renewables, nuclear energy, fossil fuel, energy conversion and energy storage. To address the novel energy challenges, the new functional materials systems should be developed and their applicability in energy conversion devices as fuel cells, batteries, nuclear reactors, and separation membranes should be proved. Progress in the development of new technologies for unconventional hydrocarbons (shale oil and gas) also depends upon discovery of new functional materials. Nanotechnology has the potential for making impact on this effort by developing the advanced materials, tools and devices that are more efficient. A unique aspect of nanomaterials is the significantly enhanced their properties related to increased relative surface or grain boundary area, and the dominance of quantum effects. These effects enhance chemical reactivity, making some nanomaterials useful as catalysts, sensors, and components of fuel cells and batteries to improve their efficiency. These devices play also important role in the development of novel energy conversion processes of unconventional hydrocarbons. In this lecture, the ability to use nanomaterials in energy conversion will be discussed. The ability to enhance the physical properties of oxygen - CeO_2, ZrO_2: Y, Sc and proton- $SrCeO_3$: Yb conductors will be presented. Scaling factors, such as grain size, thin film thickness, and porosity will be discussed in the context of a lattice defect model, and will be illustrated by recent results obtained for nanoceramic thin films, nanoscale superlattices, and mesoporous materials. 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 also on methodologies to develop new oil and gas technologies through physics, chemistry and materials science.

Biography

Igor Kosacki has completed his PhD in Physics from Institute of Physics Polish Academy of Sciences and Postdoctoral studies from Piere and Marie Curie University in Paris and Massachusetts Institute of Technology in Cambridge. He is holding Professor Title awarded by the President of Poland. Currently, he is Emerging Technologies Scientist at Honeywell International Inc. In his current role, he is responsible for the development new research program for oil and gas materials. He has published more than 120 papers in reputed journals and has over 4500 citations. He is serving as Chair of Nanotechnology and Corrosion Symposium on NACE Conferences.

Notes:

igor.kosacki@honeywell.com