SOFC Platforms for Clean Power and "Blue" Hydrogen Production from Fossil Fuels

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Globally, fossil fuels provide 82% of the world's energy and 62% of the electricity generation, while releasing ~ 37 Gtons of CO_2 into the atmosphere. Clearly, a clean energy future requires total decarbonization and electrification of the energy economy for sustainability, but the current deployment rate and integration of renewable sources into the electric grid falls short of targets.

Ceramic fuel cells offer a viable transition pathway towards a sustainable energy economy. They are highly efficient and environmentally friendly electrochemical engines that allow a single-step conversion of chemical energy into electricity. As the product stream is composed of highly concentrated CO_2, no post-separation is required for capture. They provide an alternative pathway for smooth transition into a sustainable energy economy without major disruptions in energy production by allowing continued but smart use of fossil fuels until renewable sources dominate the global energy.

After framing the global energy landscape, this presentation will discuss the opportunities and technical challenges of converting fossil fuels in solid oxide-base fuel cells (SOFC) with focus on solid fuels including coal. Using the SOFC platform, the presentation will introduce the new concept of electrochemical gasification to produce 'blue' hydrogen from steam using fossil fuels without heat or electric power input. It will also present opportunities for re-utilization of carbon by electrochemically converting CO_2 to fuels. These technological pathways will help avoid major disruptions to energy supply and offer a smooth transition into a clean energy economy.

Bio:

Turgut M. Gür is an Adjunct Professor of Materials Science and Engineering at Stanford University, where he recently retired after nearly four decades of a distinguished career that also included leadership for three major multi-disciplinary theme-based research centers on campus focused on advanced materials and energy conversion and storage.

He is the immediate past President of The Electrochemical Society (ECS), which is one of the oldest scientific societies in the US and the largest international society in its field in the world serving as the scientific home to 16 Nobel laureates and nearly 8,000 member scientists from 80 countries across the globe. He also serves on the ECS Board Directors and is an inducted Fellow of The Electrochemical Society.

He is a highly cited and internationally recognized leader in high temperature electrochemical energy conversion and storage technologies, materials and processes with 11 US issued patents, 171 technical publications, and 150 presentations at international conferences, and more than 80 invited talks, lectures, and colloquia.

He holds BSc and MSc degrees in Chemical Engineering from the Middle East Technical University in Ankara, Turkey, and three graduate degrees including a Ph.D. in Materials Science and Engineering from Stanford University.