CISTalks

Time: **2024-03-27T15:00**

Location: **BBBF-311, Yeditepe University**

Open to the public. All are invited.

Digital Twin Technology:
Virtual Prototype of Solid Oxide Fuel Cell Systems

Taner Akbay

Yeditepe University, Materials Science and Nanotechnology Engineering

Abstract

Digital twin technology involves creating a virtual prototype of a physical system that is defined by interconnected, complex functioning group of entities. In the context of fuel cell systems such as solid oxide fuel/electrolyser cells (SOFCs), digital twins are utilised to create virtual copies in order to design, test, validate, monitor, and control the functions of components as well as the entire system itself. Monitoring of the multi-physics field states resulting from interplaying heat, mass, and electrical transport within the SOFC system is not only a daunting task but also very time consuming and expensive. Together with appropriate control strategies, this technology integrates data-driven approaches with physical models to enhance the design, control, and operation of complex systems like SOFCs. By combining physical knowledge with simulation techniques, digital twins facilitate performance prediction, lifetime estimation, fault diagnosis, and optimisation in fuel cell technologies. In this presentation a representative digital twin of a small residential SOFC system will be introduced.

Biography

Taner Akbay is a full professor at the Department of Materials Science and Nanotechnology Engineering where he serves as the head of department. After receiving his BSc and MSc degrees in Metallurgical Engineering from Middle East Technical University in 1986 and 1989, respectively, he obtained his PhD degree in Materials Engineering from Imperial College London in 1993. His research interests cover the broad area of electrochemical energy conversion and storage applications namely solid oxide fuel/electrolyser cells, lithium-ion batteries, dual-carbon, dual-ion batteries, and photocatalysis.