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Novelties in additive manufacturing and bio-printing

Fuel cell electric vehicles (FCEVs) are demonstrating commercial readiness: fully-functional fuel cell/ electric hybrid vehicles with >400 km range and refuel times of <4 minutes have been shown to be feasible. Leading automakers (including Toyota, Daimler, Ford, Honda, Nissan, Hyundai, and GM) have supported, and are continuing to support FCEV development and deployment with billions of dollars of investment spent to date and further significant investment planned. These automakers foresee that FCEVs are a key option in the overall advanced power-train portfolio that will allow them to meet the complete range of customer needs while at the same time complying with environmental, energy efficiency, and regulatory requirements (especially as zero emission vehicles, fuel economy, and greenhouse gas policies are being developed). Some of the technical barriers of polymer electrolyte membrane fuel cell (PEMFC) technology have been clearly identified at a high level. These involve materials cost, performance, reliability, and durability. Currently, electrodes make up almost half of the MEA cost and increases in catalyst efficiency and manufacturing cost reduction in this area are expected to have a large impact on the overall cost. The cost of catalyst ink, even at large volume production of 500,000 units/year, will still represent the highest cost component. However, to be competitive with the internal combustion engine that costs only $25-35/ kW for an entire engine, the cost of the FC stack must be substantially reduced. In order to reduce the cost, we designed low Pt loading catalyst, total loading of 0.15 mg/cm^2, and evaluated the stability and durability of the low Pt loaded nano catalyst. In order to achieve the highest performance and stability with a low Pt loading catalyst, we optimized a gradient structure of the catalyst with optimized, Pt, ionomer and carbon loading.

Speaker Biography

Radenka Maric is the vice president for research at the University of Connecticut. She has been developing nanomaterials and catalysts for fuel cells since 1996. She worked for Japan Fine Ceramic Center, Japan, Engi-Mat, Atlanta, and the National Research Council Canada, Vancouver, before joining the University of Connecticut, Storrs, in 2010. She has published more than 200 papers and is an inventor on eight patents. She is a world-renowned expert in nanomaterials processing for energy applications. A major component of her research has been the development of new manufacturing processes for Solid Oxide Fuel Cell (SOFC) and Proton Exchange Membrane Fuel Cell (PEMFC) components that can potentially lower the cost of materials and processing when compared to traditional fabrication techniques.

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