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## *ADVANCED CATALYSTS FOR HYDROGEN FUEL CELL TECHNOLOGIES*

Due to the overwhelming use of fossil fuels in past decades, clean and efficient energy storage and conversion via sustainable electrochemical reactions associated with hydrogen, oxygen, and water have attracted substantial attention for energy and environmental sustainability. Among compelling energy technologies, hydrogen proton exchange membrane fuel cells (PEMFCs) are a promising zero-emission power source for transportation to mitigate environmental pollution and reduce fossil-fuel dependence. Relative to traditional family cars, PEMFCs are highly desirable for heavy-duty vehicles (HDVs) requiring high efficiency, long driving distances, and fast refueling. However, current materials, including catalysts, membranes, and ionomers, cannot meet the challenging targets of high-efficiency, low-cost, and long-term durability of up to 25,000 hours (or one million miles) for HDVs. Developing high-performance cathode catalysts is crucial for significantly improving performance and reducing the costs of PEMFCs for HDV applications. His research group at SUNY-Buffalo has been well supported by U.S. DOE in the past decade, aiming to address materials issues through designing and scaling up innovative and highly efficient catalysts and electrodes. In this talk, he discusses recent understanding, progress, achievement, and perspective on developing low-cost and high-performance air cathode catalysts via two types of technique solutions, i.e., platinum group metal (PGM)-free atomically dispersed metal-nitrogen-carbon catalysts and ordered low-PGM intermetallic PtCo catalysts for PEMFCs.