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2021 WORLD FUEL CELL CONFERENCE

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Name	**Yan Xiang**
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Invited Keynote Lecture

Presentation Title	**R&D Strategies for Low-cost High Temperature Polymer Electrolyte Membrane Fuel Cell Technology**
Abstract (Approximately 200 words)	Proton exchange member fuel cells with an operating temperature over 100 ℃ (HT-PEMFCs) own remarkable features, for example, the combined heat and power generation, high tolerance for the impurities, and simplified system design, which all are favorable to the integrated reforming fuel systems. Nevertheless, the commercialization of HT-PEMFC technology has been significantly hindered by the high cost of the fuel cell due to the high loading of Pt in electrodes and the cost of the state-of-the-art high-temperature membranes (HT-PEMs) of polybenzimidazole. Toward the target of developing low-cost HT-PEMFCs, significant efforts have been made to develop novel HT-PEMs, the commercialized membrane electrode assemblies (MEAs), and the fuel cell stack prototypes in our lab. Up to date, a few novel HT-PEMs have been fabricated by several strategies including simple blending, microphase separation, cross-linking and side group grafting, etc. The casting process of PPtec® serial membrane products with a width of 40 cm and continuous length proved the feasibility in scale-up production. Along with the development of low-cost HT-PEMs, the fabrication technology of MEAs has been comprehensively improved by tuning the types and content of the binder, and the fabrication procedures of the catalytic layer, and resulted in significantly reduced cost with remained competitive performance. The MEA shows exceptional durability up to 3000 h under 150 ℃ and a constant load of 0.2 A cm^{-2}. The fuel cell stack prototype with an active area of 165 cm^2 has been assembled and under long-term stability testing. Currently, the fuel cell stack shows outstanding stability during start-up/shutdown cycles and reaches the peak power output of 1.15 kW at 150℃. Overall, the R&D strategies on low-cost HT-PEMFC technology are going smoothly which convinces the successful transformation of our fundamental research from the core materials design to commercial product and device development.
Biographical Sketch (Approximately 200 words)	Dr. Yan Xiang is a Professor in Material Chemistry at Beihang University. She serves as the Director of Beijing Key Laboratory of Bioinspired Energy Materials and Devices since 2012. Her research interests focus on advanced materials and devices R&D for sustainable energy conversion, including HT-PEMFC, fluid battery, and bioelectronics and devices. She has published over a hundred research papers among prestigious peer-review journals and serves as principal investigator of many research key projects and international collaborations. Dr. Xiang is a Fellow of the Royal Chemistry Society, UK and Vice Dean of Youth Committee of Chinese Materials Research Society. She is also the board member of The International Academy of Electrochemical Energy Science (IAOEES).