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# 2021 WORLD FUEL CELL CONFERENCE

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Name	Chulsung Bae, Ford Foundation Professor	
Affiliation	Rensselaer Polytechnic Institute, USA	
<h2 style="color: red;">Invited Keynote Lecture</h2>		
Presentation Title	<b>Molecular Engineering of Ion-Conducting Polymers for Electrochemical Energy Conversion Technologies</b>	
Abstract (Approximately 200 words)	<p>Anion exchange membranes (AEMs) based on hydroxide-conducting polymers are a key component for anion-based electrochemical energy technology such as fuel cells, electrolyzers, and advanced batteries. Although these alkaline electrochemical applications offer a promising alternative to acidic proton exchange membrane electrochemical devices, access to alkaline-stable and high-performing polymer electrolyte materials has remained elusive until now. Despite vigorous research of AEM polymer design, examples of high-performance polymers with good alkaline stability at an elevated temperature are uncommon. Traditional aromatic polymers used in AEM applications contain a heteroatomic backbone linkage which is prone to degradation via nucleophilic attack by hydroxide ion. In this presentation, I will highlight recent progress at the Bae group of Rensselaer Polytechnic Institute in the development of advanced hydroxide-conducting polymers and technology transfer effort to commercialize materials for AEM applications. We have developed new synthetic methods that produce polymer design made of all C–C bond backbone and a flexible chain-tethered quaternary ammonium group and that provide an effective solution to the problem of alkaline stability. The advantage of good solvent processability, synthetic versatility, and convenient scalability of the reaction process has generated considerable interest of these polymers, and they are considered leading candidates for commercial standard AEM. AEM fuel cells, electrolyzer, and vanadium redox flow battery tests of some of the developed polymer membranes showed excellent performance, suggesting that this new class of AEMs open a new avenue to electrochemical devices with real-world applications.</p>	
Biographical Sketch (Approximately 200 words)	<p>Chulsung Bae is Ford Foundation Professor at Department of Chemistry &amp; Chemical Biology, Rensselaer Polytechnic Institute. He received BS in Polymer Science &amp; Engineering at Inha University, MS in Materials Science at POSTECH, MS in Chemistry at University of Massachusetts at Lowell, and Ph.D. in Chemistry at University of Southern California under the guidance of Surya Prakash and Nobel Laureate George Olah. He conducted postdoctoral research with John F. Hartwig at Yale University before starting independent academic career in 2004. Bae's research areas focus on development of functional ion-conducting polymers for applications in clean energy technologies.</p>	