Fundamentals of Mixed Ionic-Electronic conductors

Lucas Flagg, NIST, USA
Scott Keene, Rice University, USA
Jenny Nelson, Imperial College London, UK
Jianyong Ouyang, NUS, Singapore

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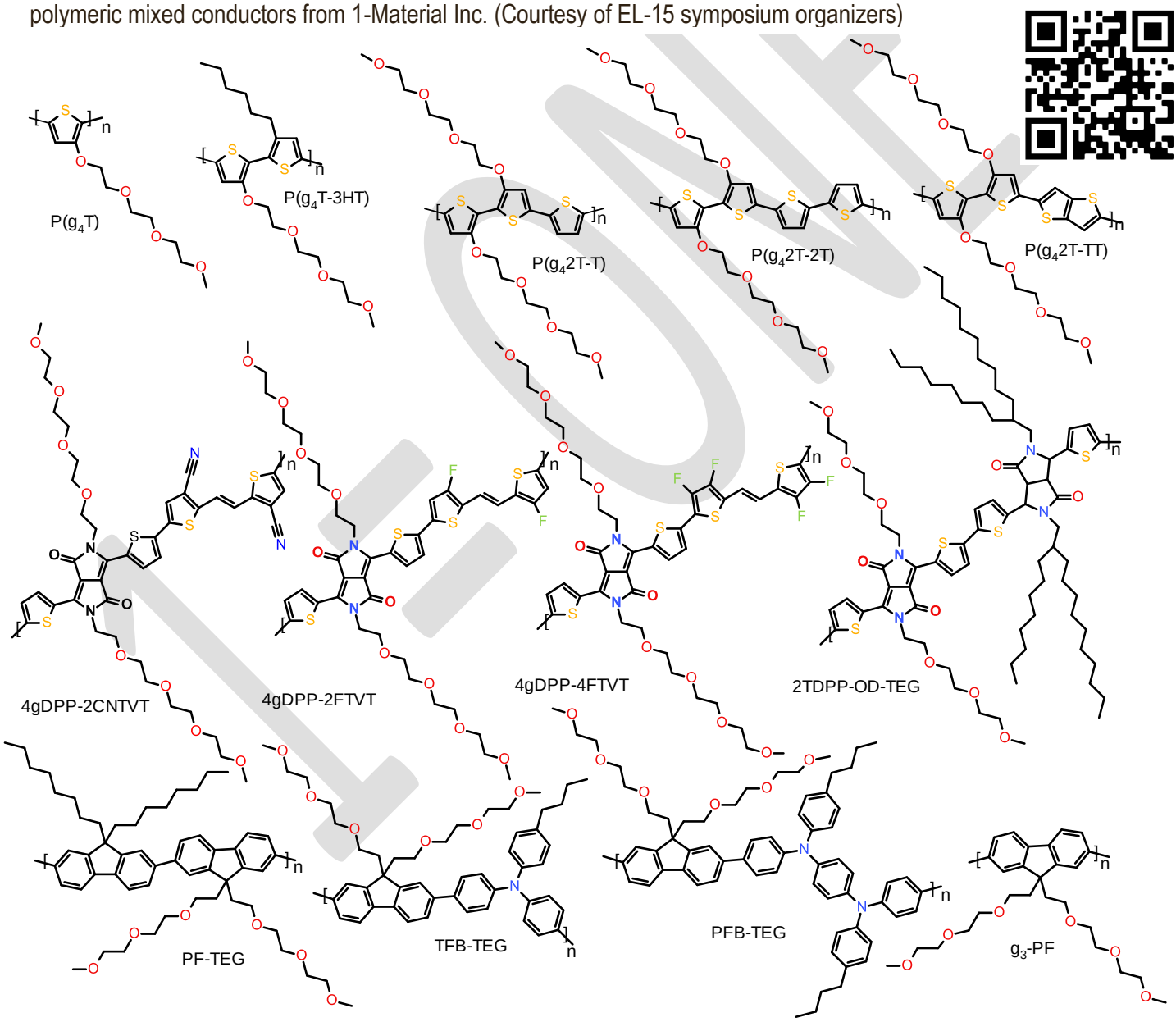
Mixed ionic-electronic conductors, also known as mixed conductors, are an increasingly important category of materials with applications in energy storage, electrochromic displays, bioelectronics, sensors, electrocatalysis, neuromorphic devices, thermoelectrics, and actuators. Mixed conductors exhibit both ion and electron/hole conductivity, and ionic-electronic coupling (i.e., capacitance), allowing them to effectively transduce ionic signals to electronic ones, and vice versa. In recent years, new mixed conductors have been developed beyond the traditional metals oxides and phosphates to include (semi)conducting polymers, radical polymers, perovskites, and hybrid organic-inorganic materials, enabling improved performance and new functionalities. Structured below are examples of polymeric mixed conductors from 1-Material Inc. (Courtesy of EL-15 symposium organizers)



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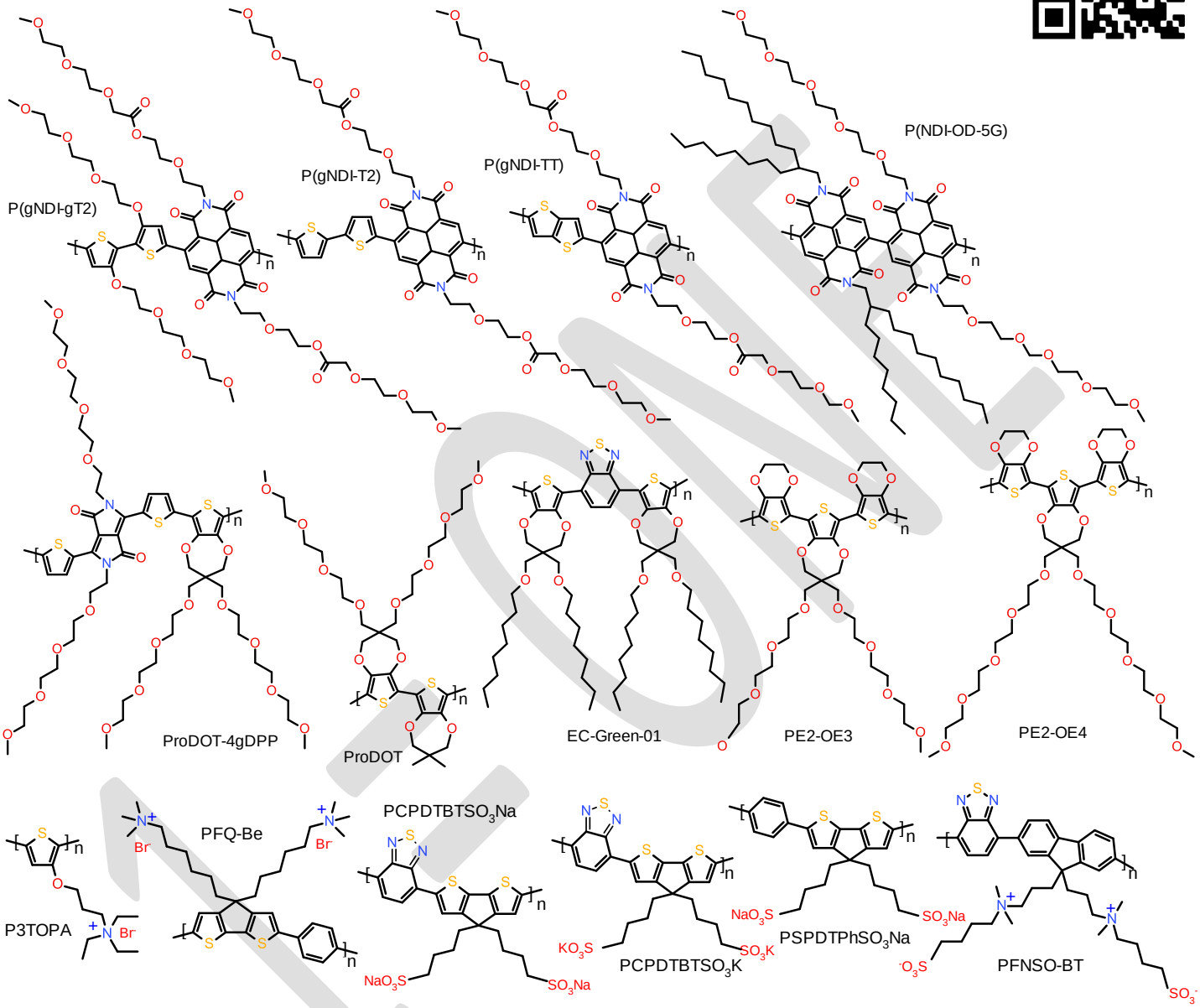
Examples of 1M Mixed ionic-electronic conductors



Despite many organic mixed ion-electronic conductors (OMIEC) having been explored, challenges remain in characterizing and modeling the dynamic relationship among electronic transport, ionic transport, and material structure during device operation. As exampled above, we have demonstrated that flanking conjugated backbones with long glycol side chains may enhance interactions with hydrated ions and water and therefore facilitate electrochemical switching in aqueous solutions. We can also make other custom ion-electron transporting polymers for your specific needs, and all the building blocks exampled in the above are available for you to construct structures you may design. For more information, please contact info@1-material.com

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