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The increasing demand for sustainable energy highlights the need for advanced materials to improve traditional energy storage systems. These systems face challenges such as low ionic conductivity in dry conditions, limited adaptability, and insufficient capacity for dynamic energy storage. Effective ion and charge transport are crucial for optimizing energy storage devices like batteries, fuel cells, and supercapacitors. However, conventional polymer electrolytes often complicate ion transport through their solvent-induced phase-separated morphologies.

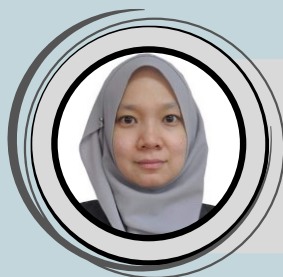
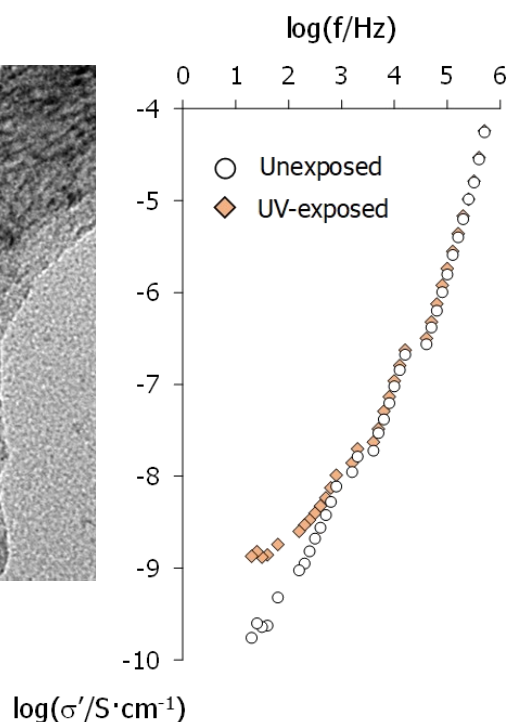
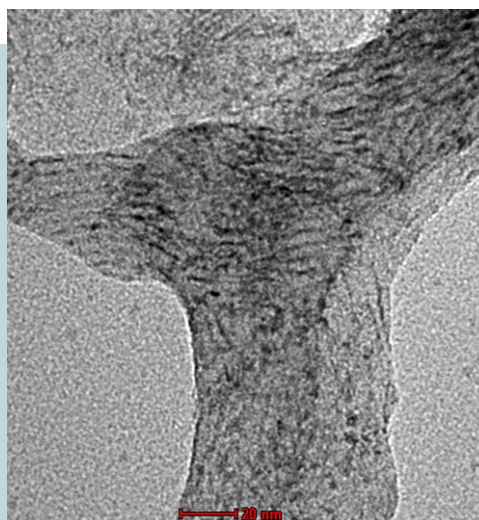
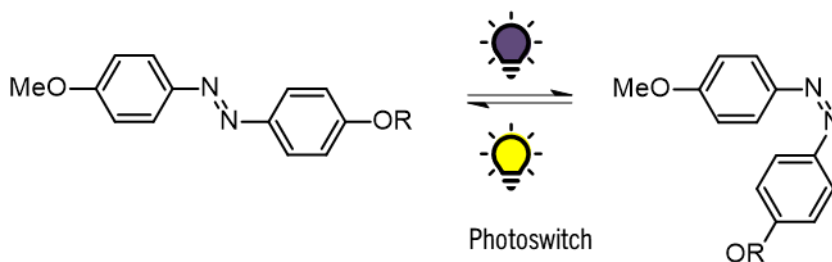
Our research introduces a new liquid crystalline terpolymer that maintains high conductivity in dry conditions and features light-responsive properties. This material incorporates azobenzene derivatives, sulfonic acid groups, and methacrylate groups, allowing it to self-assemble into ion-rich structures, enhancing charge flow without additional additives. The azobenzene components can change shape

with light exposure, enabling external control over the material's properties. This makes it ideal for advanced energy devices and solar thermal fuels. By combining strong ionic conductivity with light responsiveness, we enhance energy materials and demonstrate their practical applications in renewable energy storage and conversion technologies.

The broader impacts of this research include more efficient use of renewable energy resources, reduced environmental footprints, and the development of resilient energy infrastructure. Ultimately, our work shows how advanced materials can provide effective solutions to critical environmental and societal challenges, contributing to a sustainable energy future.

Light-Responsive Liquid Crystalline Terpolymers: Pioneering Advanced Materials for Sustainable Energy

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