Natural Eutectogels as a Novel Material for Green Wearable Electronics

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The rapidly growing field of wearable electronics faces a critical challenge: the development of materials that are compatible with human tissue. Traditional materials such as hydrogels and ionogels have a lack of tolerance and often result in rigidity, discomfort, and potential biological hazards. Our project introduces a transformative solution: a eutectogel-based artificial ionic skin that is sustainable, low cost, non-toxic, and readily accessible. Eutectogels are formed by the polymerization of a deep eutectic solvent (DES) and are an innovative material constructed from hydrogen bond donors (HBD) and acceptors (HBA). Our unique contributions are the incorporation of natural derivatives into the HBD and HBA selection and the integration of cellulose-based derivatives such as cotton, which enhance the mechanical properties of the gel. Through extensive testing, we have identified an optimal combination and ratio of DES components, resulting in an eutectogel that improves upon previous versions in many properties such as adhesion, flexibility, stability and motion sensitivity. These enhancements not only allow for the production of thinner, sensitive interfaces capable of effectively capturing and transmitting biopotential signals but also ensures excellent adhesion and stability for a wider range of applications. Our work represents a development towards more sustainable and reliable biopotential monitoring for patients.

Awards Won:
Air Force Research Laboratory on behalf of the United States Air Force: Glass trophy and USAF medal for each recipient
Air Force Research Laboratory on behalf of the United States Air Force: First Award of $750 in each Regeneron ISEF Category,