



Colorado Science and Engineering Fair

**2024
Team Project
Abstract Form**

Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.

Title of Project: Natural Eutectogels as a Novel Material for Green Wearable Electronics

Team Leader's Name: Claire Huang

Team Member 1: Sophia Zhang

Team Member 2:

School and City: Fairview High School, Boulder

Sponsor's Name: Dr. Yinghua Jin

Category: Chemistry (CHEM)

Division: Senior (9th - 12th grades)

Abstract (250 words or less):

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.

We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. We also attest that the above properly reflects our own work.

Team Leader's Signature: Claire Huang

Date: 2/28/24

Team Member 1's Signature: Sophia Zhang

Date: 2/28/24

Team Member 2's Signature: _____

Date: _____

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES of all of these forms to your Regional Fair Director with your Finalist Verification/Permission Form. A signed copy of this form must be included in your notebook.