

**Project Title:** Wearable Sweat Biosensors for Astronaut Stress Monitoring

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**Abstract:**

One of critical objectives of NASA Human Research Program is “understanding and mitigating the highest risks to astronaut health and performance to ensure that crews remain healthy and productive during long-duration missions beyond low Earth orbit.” In this work, we plan to develop wearable biosensors to assess and manage physiological and psychological stress of astronauts through measuring stress-related biomarkers in sweat, and thus improve astronaut health and performance through early detection and intervention.

In current stage, our work mainly focuses on the sensor development for stress biomarker detection. Adrenaline (AD), also refers to epinephrine, is a hormone produced in the adrenal glands. AD acts as a neurotransmitter and it is one of the causations for the problems of anxiety, palpitations, high blood pressure, etc. AD exists in sweat, blood and other human body fluids. The measurement of AD is critical for astronauts’ stress monitoring.

A composition of reduced graphene oxide and gold nanoparticles (rGO-AuNPs) onto glassy carbon electrode (GCE) was developed through electrodeposition and used for the detection of AD. The detection of AD was performed using differential pulse voltammetry (DPV). The sensor (rGO-AuNPs on GCE) was characterized and optimized through various experiments. An optimal composition was achieved and the optimized sensor on the AD detection presented a limit of detection (LOD) at 70 nM. We will keep working to develop this sensor towards its wearable format on the basis of our current findings on AD detection/measurement.