# Year Two: Digital Light Processing Printing of Hierarchical Porous Carbon for Environmental Remediation and Water Desalination

Hua, Howard (School: Wheeler High School)

The purpose of this project was to identify possible avenues to fabricate high-performance composites and carbon materials for a variety of engineering applications. I printed lattice composites and porous carbon with widely tunable density and mechanical properties, and porous lattice structure with tunable wettability for oil-water separation.  To test efficacy of the device for oil-water separation, an oil spill was modeled, and the device was used to attempt to collect as much residual oil as possible. To a shallow petri dish was added 20g of saltwater and four drops of hexane dyed using 0.3 wt% of Sudan I or 0.1 wt% of Oil Red O. Hexane was an excellent substitute to crude oil due to its low viscosity and being its major constituent. After the device was introduced, it began absorbing hexane. The device was slowly moved around (analogous to a tugboat dragging an oil boom through water) to improve oil absorption.  To showcase this material's promising use in seawater desalination, a basic carbon cone was designed, printed and pyrolyzed using the novel resin.  To begin the experiment, 8 cones were aligned with the tip pointed upwards. To a large plastic jar with a transparent lid was added the shallow dish and 3.8g of saltwater. An LED calibrated to output 0.1 mW/cm2 at a color temperature of 5700K was as used to model the average solar irradiance from the Sun on a clear day, and a fan was used to cool the LED. Each experiment lasted for 90 minutes. The amount of desalinated water collected was quantitatively defined as the change in mass of the outer plastic jar. There was a significant difference between the amount of water collected using the cones than without.

**Awards Won:**

Aerojet Rocketdyne Foundation: First Award of $1500.00