Maximilian Shen

Harvesting Water from Air with Solar Power for Underdeveloped Areas

The global human population is currently seven billion and is expected to grow to eleven billion by 2050. This makes problems such as water scarcity challenging as five hundred million people live under water scarcity twelve months a year. The goal of my project is to create a cost effective water harvester that is fully solar powered and capable of pulling water out of the air without having to rely on expensive infrastructure to power my device and without the need to access water sources such as rivers and lakes. My design is based on a design done by Kim et al. 2017 that utilized metal organic frameworks (MOF) to absorb moisture from their device. The moisture was then turned into water condensate by cooling. I replaced the expensive MOFs with cheap silica gel and made my device fully solar powered. My harvester consists of silica gel which absorbs water moisture during the night and a solar absorber which is black sheet metal capable of absorbing sunlight and desorbing the moisture out of the silica gel. The desorbed moisture is cooled by a solar powered thermoelectric cooler, generating water condensate. I tested each component individually with the silica gel being able to absorb ~40% of its mass in 85% humidity and the solar panels were able to generate 12.24 V of electricity to power a 12 V thermoelectric cooler and fan to generate water from the device. The final device was capable of generating water fulfilling proof of concept.