The reason why we are conducting this research is to determine what is the optimum combination of adsorption time and desorption temperature of hydrogel. This allows us to compare its viability against other materials such as silica gel, aluminum mesh, zeolite, etc. used in atmospheric water harvesting. We hypothesize that our current choice of hydrogel set to parameters of temperature, thickness, and time will outperform the other competitors. Our research could contribute to the field by potentially developing an atmospheric water harvester that could rapidly absorb and desorb water every 30 minutes throughout the day.

Objective

Prepare foam thinly layered with hydrogel
Place on hot plate to raise the temperature of the hydrogel-coated foam
Model the absorption and desorption of hydrogel, changing parameters as necessary to obtain the greatest amount of yield from an average setting (around 60 percent in San Diego).
After modeling, figure out the ideal cycle of absorption and desorption that was most efficient.

Discussion

From the graph, we saw that it was only important to look at relevant times in the graph as after a certain point the changes in capacity were negligible, which narrowed our focus to two regions. Looking at the two regions and using linear approximations, we tested different combinations of absorption and desorption times to estimate the ideal combination that would yield the most water absorbed in 24 hours. We found that the optimum cycle included 15 minutes of absorption and 5 minutes of desorption. With this, it yielded 17.48 g/g of water in 24 hours.

While this optimization of harvesting the most amount of water is a good start, we must use this model of the best combination of absorption and desorption cycles and determine whether a 15-minute absorption cycle and 5-minute desorption cycle is the optimum cycle that yields with the most water captured and harvested. Our model does not take into account the existing water that isn’t fully desorbed in each cycle, which could change the results over 24 hours.

Conclusion & Future Works

• The importance of our work is that we find the optimal material and absorption/desorption cycles for an atmospheric water harvester
• We used extensive data from research and modeled for different relative humidity and temperatures to find the absorption and desorption curve
• Our main findings are that 15 minutes of absorption and 5 minutes of desorption yield the most water using the shortest amount of time.
• The next steps for research would be different augmentations for the thin layer of hydrogel and what other materials we can combine hydrogel with.
• Optimize our method of finding optimal absorption time/used linear approximation which didn’t allow us to find the exact time of absorption and desorption
• Find the optimal cycles for different relative humidity levels
• Try to make these cycles more energy efficient (change from absorption to desorption with energy from the sun)

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