Thermal Distillation Using Heat Localization

Tennessee TECH

Divya Jaladi, Ehsan Languri, Téa Phillips

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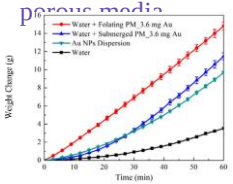
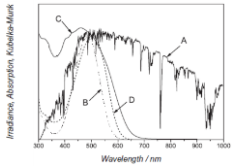
Introduction

Heat Localization is the process of restricting heat transfer for the purpose of localizing thermal energy to the certain layers. It is used to increase the rate of evaporation in water by targeting only the top layer. This process works by using different interface materials to increase heat concentration without using electric energy.

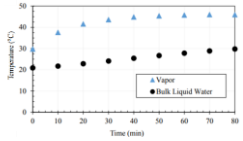
One major benefit of this process is that it can be used in some of the most remote areas of the world because it only requires two parts: solar energy and porous media.



Wang[1] studied the evaporation rate at 10kw/m^2 using bio-inspired interface media and obtained an 85% increase in evaporation rates.



Nigatake[2] studied water permeation effects from different wavelengths and reported visible solar light is able to desalinate seawater.



Jaladi[3] studied an innovative distillation process concluding the efficiency of water condensation can reduce the rate of distillation.

Materials

Porous media is used as a heat concentrator to localize thermal energy to the top layer of fluid, increasing the rate of evaporation due to capillary action of pores.

Carbon foam

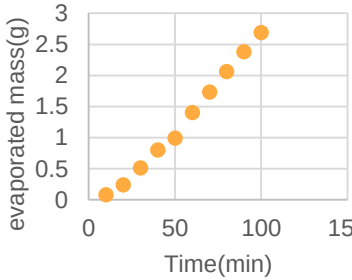
Exfoliated Graphite

Experimental Setup

Solar simulator is set to emit one sun concentration and evaporation rates are studied, using porous media as interface materials. Mass changes are recorded on the scale electronically.

Results

Graph plotted between evaporated mass and time shows increase in evaporated mass When carbon foam and exfoliated graphite are used as interface materials.



Conclusion

Results revealed that evaporation efficiency is increased and condensation rate did not match the evaporated mass[2] an efficient distillation system can solve this problem. Future work will be focused on improving the condensation and overall distillation efficiencies.

Acknowledgment

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References

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