

Modeling of Solar Desalination and Coagulation Used in Wastewater Treatment to Educate High Schoolers on Food Waste

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Problem Statement & Objectives

Goal of the Project:

Design an educational activity that would illustrate food waste recovery from waste water.

How to do That:

Design two experiments which take food waste in solution and separate the solution to both collect food waste and purify water. We first need to explain the connection between food waste and waste water, which comes from the use of garbage disposals and the use of water to clean dishes. The food waste can be collected from the solution using a coagulant which clumps particles of food waste together separating them from the solution to then be processed in a anaerobic digester. Solar desalination can be used to purify water further by removing salt from the water by evaporating and collecting the water.

Solar Desalination

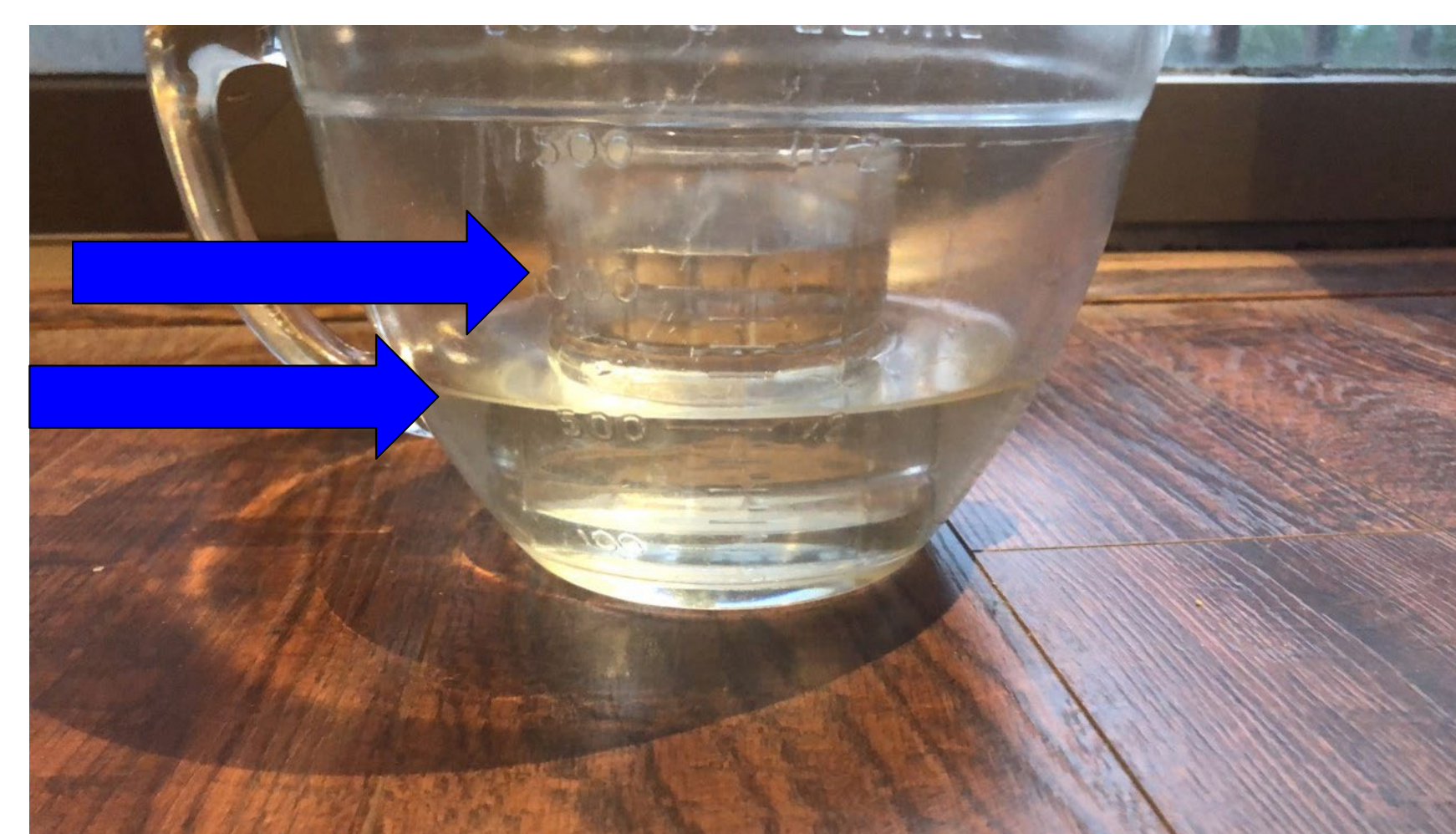
- Developing a classroom activity to model the process of desalination which could be used in a high school chemistry classroom
- The process of desalination includes the evaporation of water particles which are directed to a container which collects condensation as the water returns to a liquid state. This can collect almost all of the water initially added to the system with increases in surface area and light source decreasing the time needed.
- Connect the process of desalination to the process used in treatment plants
- Connect water treatment to the issue of food waste

Before

After 2 days



Inside water level increases as outside water level decreases



Sustainability

- These small scale demonstrations of solar desalination and coagulation are but steps towards achieving the 6th and 11th 2030 sustainability goals set by the UN. The fruits of both processes provide a potential new source of clean drinking water for countries that lack access to conventional sources and a more sustainable way of living for cities and communities worldwide. Through reclaiming wastewater throughout our consumption process, we can attain reliable and renewable water for all.

Coagulation

- Formulate a classroom integratable experiment demonstrating coagulation at the high school level
- Link this small level coagulation process with the processes employed in wastewater treatment
- Contrast the journey of our food waste and how we manage reclaimable water

The Process

Prior to the main experiment, aqueous solution of various materials (pasta, flour, etc..) were tested as potential models of food waste. Each jar, containing ~1 cup 50/50 mix of skim milk and water, had 2g of alum added as coagulant. After being shaken for ~10 seconds, the jars were left to sit as seen in the picture to the right. Approximately 90% of the skim milk particles seemingly coagulated thanks to the alum atop the water. In order to purify the remaining particles, it is assumed we would need to add more alum.

Uncoagulated

50/50 Milk/Water Emulsion before addition of Alum

Coagulated

50/50 Milk/Water Emulsion after 2g Alum was added and shaken

Immediately after shaking

4 days after shaking

