Enhancement of solar stills through corrosion prevention and improved hydrophobic glass coatings

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Background
• Solar desalination utilizes the process of condensation and evaporation to purify water
• Solar stills utilizes solar desalination and are at risk to corrosion due to exposure to brackish water
• The glass top of a solar still condescends the evaporated water and transports it to distillate collection

Objectives
• Test efficiency of corrosion resistant aluminum etching
• Initiate the search for hydrophobic glass coatings to improve condensation collection efficiency

Methods
• A corrosion reactor was created by combing a simple distillation with a heating apparatus and an aluminum surface
  • Scanning electron microscope images were taken before and after boiling experiments in the corrosion reactor as well as elemental analysis of the aluminum surface
• Hydrophobic coating of TiO2 was tested on microscope slides
  • Measure of transparency and hydrophobicity were taken
Results
Corrosion reactor
• Etched aluminum showed evidence of corrosion and scaling from SEM and elemental analysis but from observation the scaling is easily removed

Hydrophobic coating
• The hydrophobic coating showed marginal improvement when compared to untreated glass

<table>
<thead>
<tr>
<th>Concentration (M)</th>
<th>Contact angle (°)</th>
<th>Transparency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.000</td>
<td>18.2</td>
<td></td>
</tr>
<tr>
<td>0.003</td>
<td>22.1</td>
<td>97.90%</td>
</tr>
<tr>
<td>0.013</td>
<td>22.1</td>
<td>98.15%</td>
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<tr>
<td>0.028</td>
<td>21.7</td>
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<tr>
<td>0.038</td>
<td>22.75</td>
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<tr>
<td>0.050</td>
<td>19.33</td>
<td>96.66%</td>
</tr>
<tr>
<td>0.075</td>
<td>19.75</td>
<td>92.52%</td>
</tr>
</tbody>
</table>

TiO$_2$ treated microscope slide samples

Future work
• Rerun experiments with other synthetic water components
• Rerun experiments over a longer period of time to test the etching integrity
• Recreate published experiments found during literature review to create superhydrophobic coatings