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To: EDGES Group
From: Alan E.E. Rogers
Subject: Tests of super hydrophobic coatings for dew reduction on blade antenna.

Memos 161 and 178 discuss the effects of moisture condensation on the performance of EDGES blade antenna. Figure 1 of memo 178 show drops of water on the underside of the antenna panels and into the gap between the panels. These drops of water were seen in the morning following a cold night during which the temperature of the panels dropped below the dew point. While this condition is aggravated by radiative cooling of the panels due to the high IR emissivity of the Goldstone paint we are reluctant not to use this point to avoid the extremely high temperatures in the Sun which will result without it. A possible solution to the problem of dew formation is to add a super hydrophobic coating to the panels. While a coating will not completely prevent condensation it will change the way and rate the water forms on the panels. In a test done in the laboratory in which an aluminum plate is cooled below the dew point which a thermoelectric element is found that on the uncoated surface water forms in large blobs (see right half of panel in Figure 1) compared with small regular blobs in the coated surface (the left half of the panel). As long as the small blobs cover a small fraction of the surface the condensation rate is lower than condensation rate on an uncoated surface. Neverwet has the best performance of the super hydrophobic tested. However it's not yet clear how long a coating of Neverwet will last. Also comparative tests made outside have not yet been made. It has been determined that an Neverwet coating over goldstone paint doesn't significantly affect the IR radiance.

I have repeated the "Neverwet condensation test" found on the web and it appears to be valid despite the apparent lack of any scientific papers on the observed condensation rate on super hydrophobic surfaces. My theoretical understanding is based to the absence of attraction of a water molecule to a hydrophobic surface so that as long as the hydrophobic surface remains largely free of moisture it will condense more water slowly until the entire surface is covered. When the entire surface is covered with a layer of water the hydrophobic action is shielded and will no longer slow the condensation rate. It is emphasized that the hydrophobic coating only provides a "delayed action" which may be sufficient to prevent significant condensation on antenna panels before the heat of the day is available to remove any condensation that might have occurred during the night.

See <https://www.youtube.com/watch?v=8FdjmQMYptk>

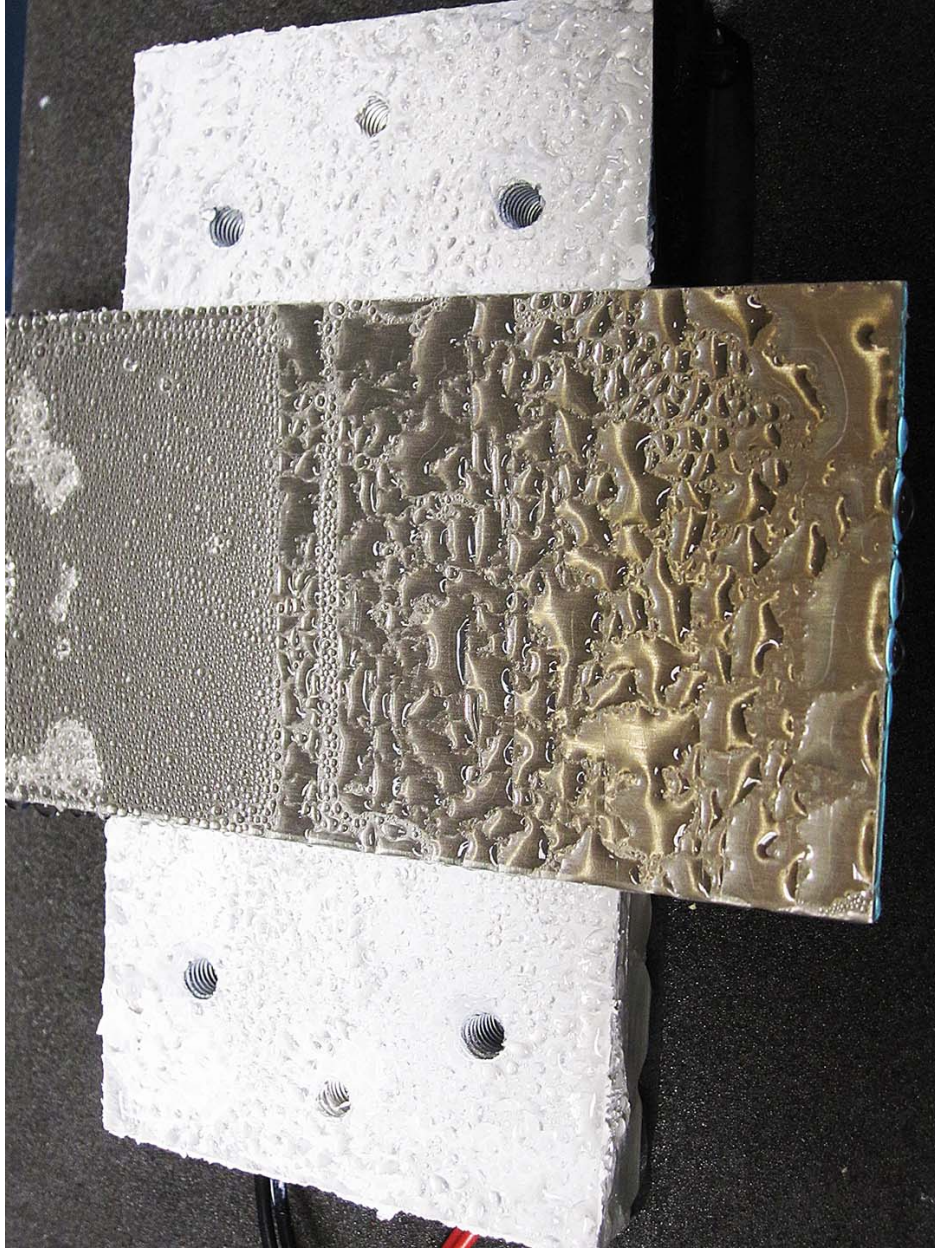


Figure 1. Condensation on aluminum panel cooled to 5°C. Left side is coated with Neverwet.