Sea salt as a potential ocean mirror material.

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Supplementary Information

Diffuse reflectance measurement

A Gnome Alphax Major slide projector, containing a 300 W Hanimex 5 filament bulb as light source modified so that its beam was reflected by a mirror 0.2 m from the lens, at an incident angle of 0° onto the samples 185 mm below (Figure S1). A BPX 65 photodiode shunted with a 10 kΩ resistor was placed at the end of a detector tube which was internally blackened and this was placed above the samples at an angle of 45°. The cone half angle fixed by the length and diameter of the sensor tube was 6° so that when the photodiode was at a vertical height of 100 mm, the major axis of the ellipse 'viewed' by the sensor was 42.5 mm. The illuminated area was 90 x 90 mm^2. Multiple readings were taken by moving the sample while keeping the 'viewing area' within the illuminated area. A gauge rod was fixed to the device to fix the height of the reflecting surface.

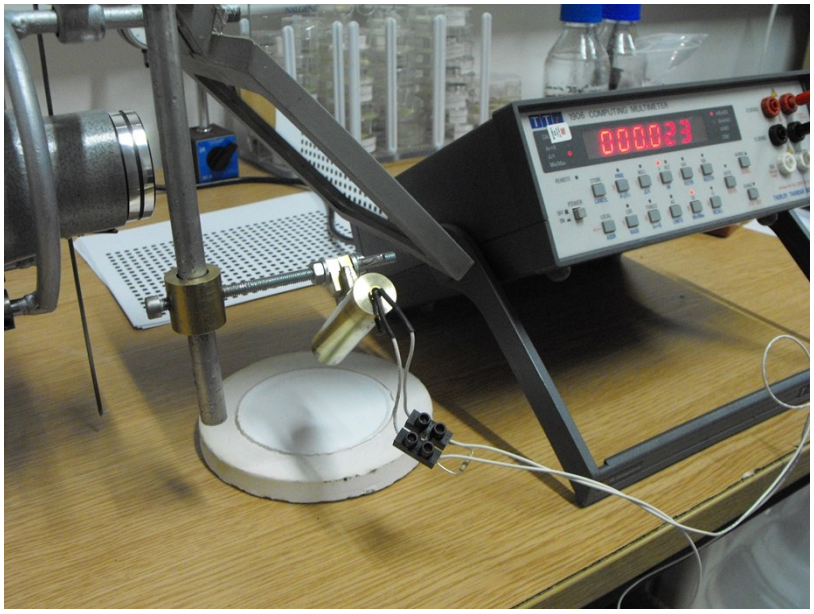

Figure S1. Diffuse (0°/45°) reflectance measurement. The barium sulphate disc is shown.

A Thurlby Thandar 1705 programmable multimeter was used to take readings of photodiode voltage across the shunt. To obtain diffuse reflectance, these readings were compared with those given by a barium sulfate disc of diameter 90 mm which was slip cast into a plaster mould and a polytetrafluoroethylene (PTFE) block 140 x 140 x 12 mm^3. The recorded voltage (with 95% confidence intervals for n=14) for barium sulfate was (15.65±0.02) V and for PTFE (14.95±0.03)

V. The barium sulfate has a reflectance of 97% [20] and deduced from that, the PTFE reflectance was 93%. This is the same as the value quoted for Berghof Optical PTFE for the wavelength range 250-2250 nm [21]. Measurements were quite insensitive both to small deviations of the reflective surface from the gauge height and to sample tilt.

Voltage across the photodiode shunt was in the region 0-16 mV and in this mode is linear. Linearity was checked using arrays of blackened squares of differing area fractions. These were printed on a Xerox Colorcube 8900 printer which is able to print large areas of uniform dark and avoids overbiasing which can cause specks of toner to appear in light regions in conventional xerography. The results are shown in Figure S2.

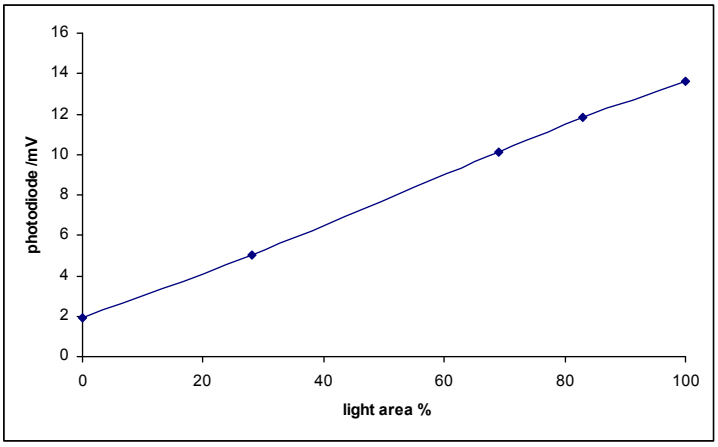

Figure S2. Photodiode voltage as a function of the light area of black and white grids

Preparation of black reference surfaces

A matt black surface was formed on copper using the proprietary Ebonol C solution which is an alkaline phosphate into which copper is immersed at 90°C for 15 minutes [22] in order to produce a black reference.

Polystyrene Petri dishes were sprayed with matt black paint (Halfords 2004/42iiBe840839). The uniformity of reflectance from these surfaces is reduced by operator effects. In a matt paint if the coating is allowed to flood, the upper surface dries rich in paint vehicle which tends to increase reflectance.