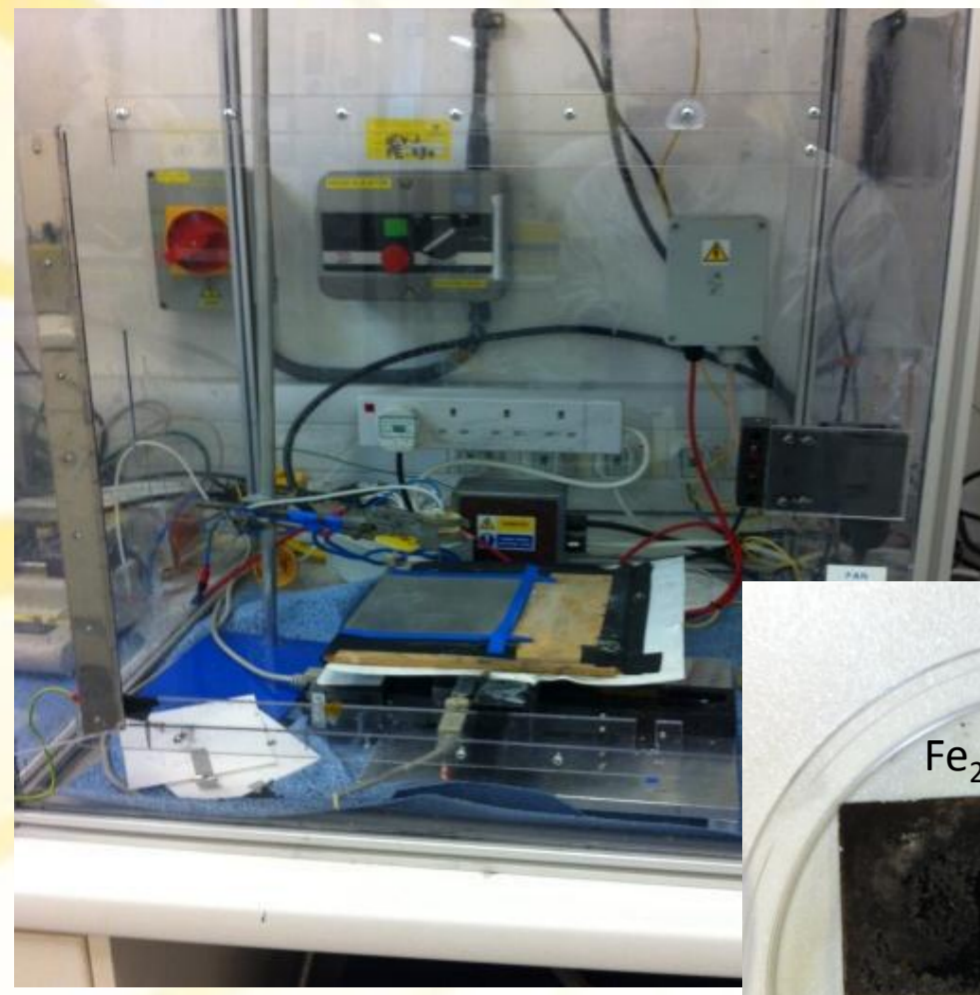


Solar Absorbing Nano Coatings

Nikita Bascombe
Bedford Girls School and Cranfield University

The aim of this project was to develop a solar absorbing coating that could be applied to a variety of substrates.

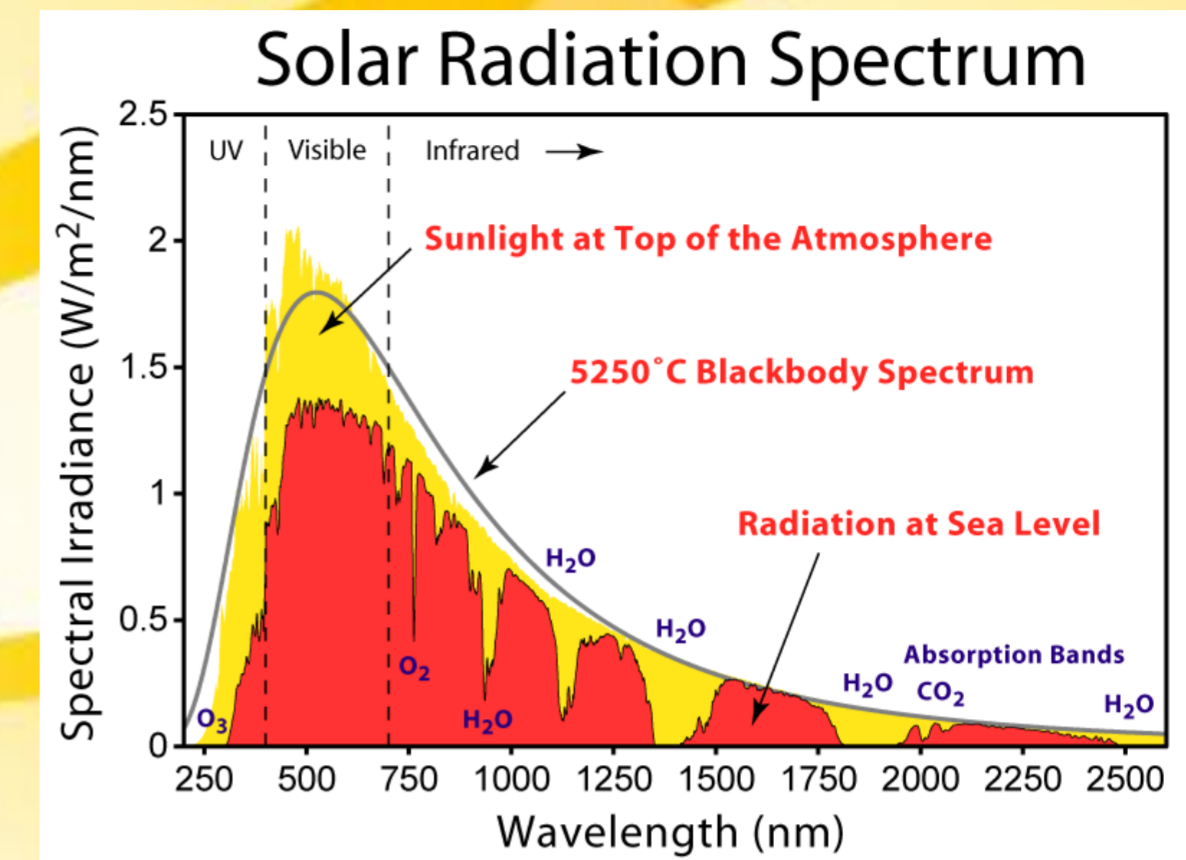
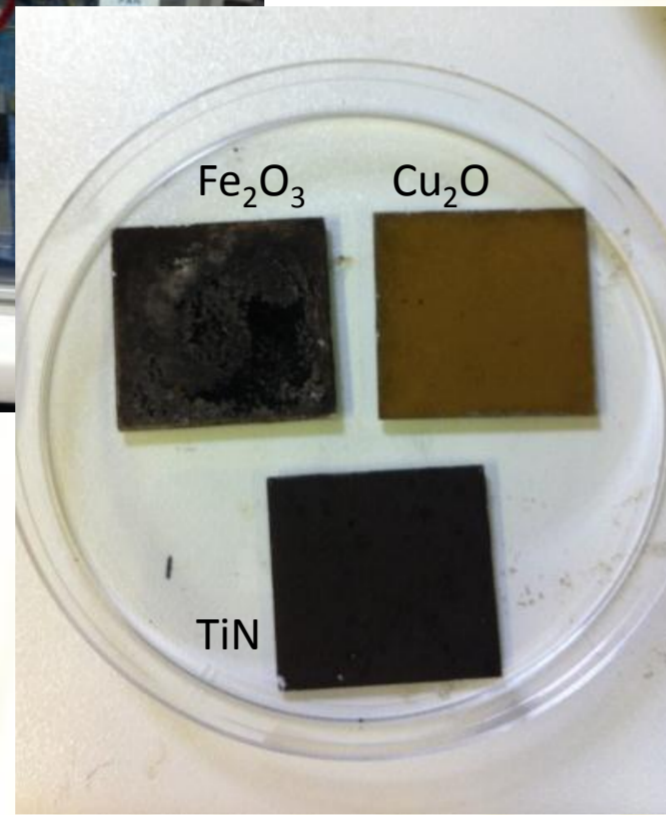
Coating deposition



Electrospray equipment and infiltrated samples

Nano inks deposited by:

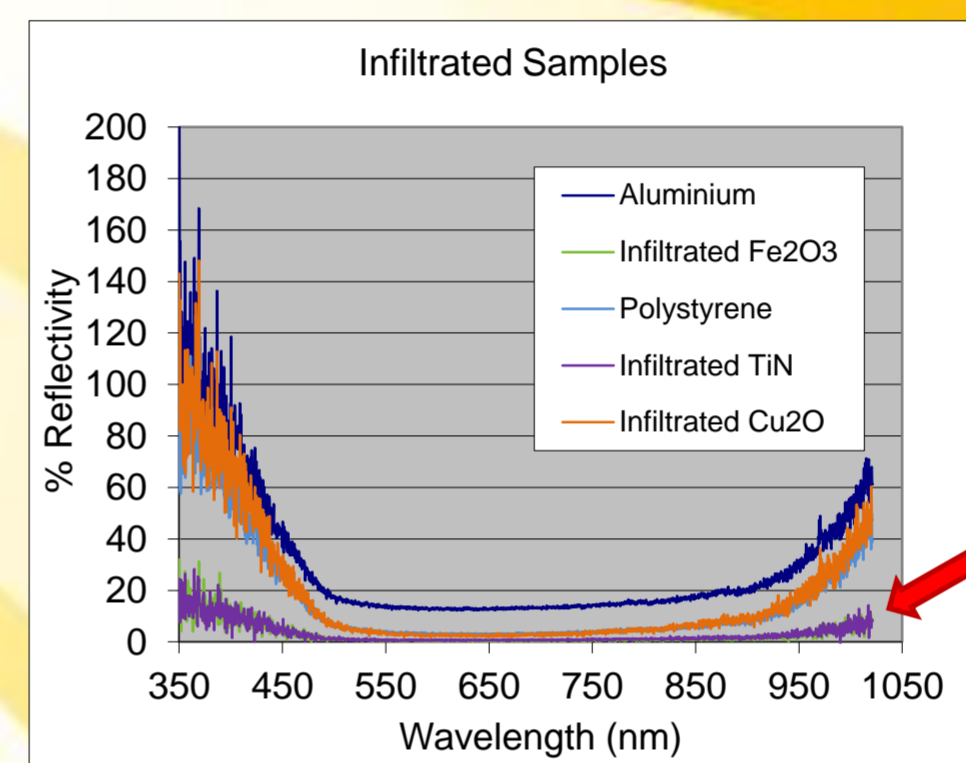
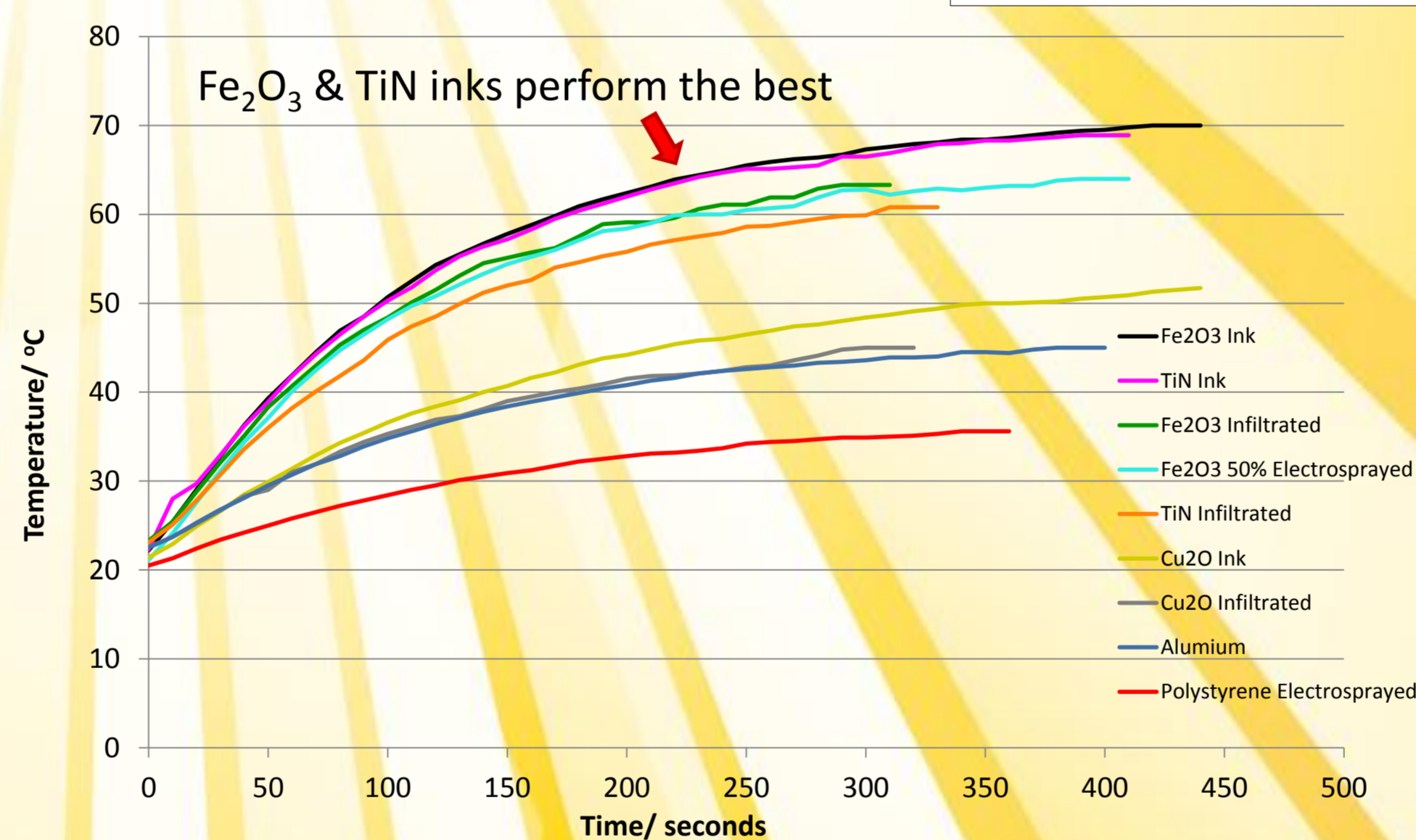
- Electro spray
- Infiltration into a polymer network
- Spreading



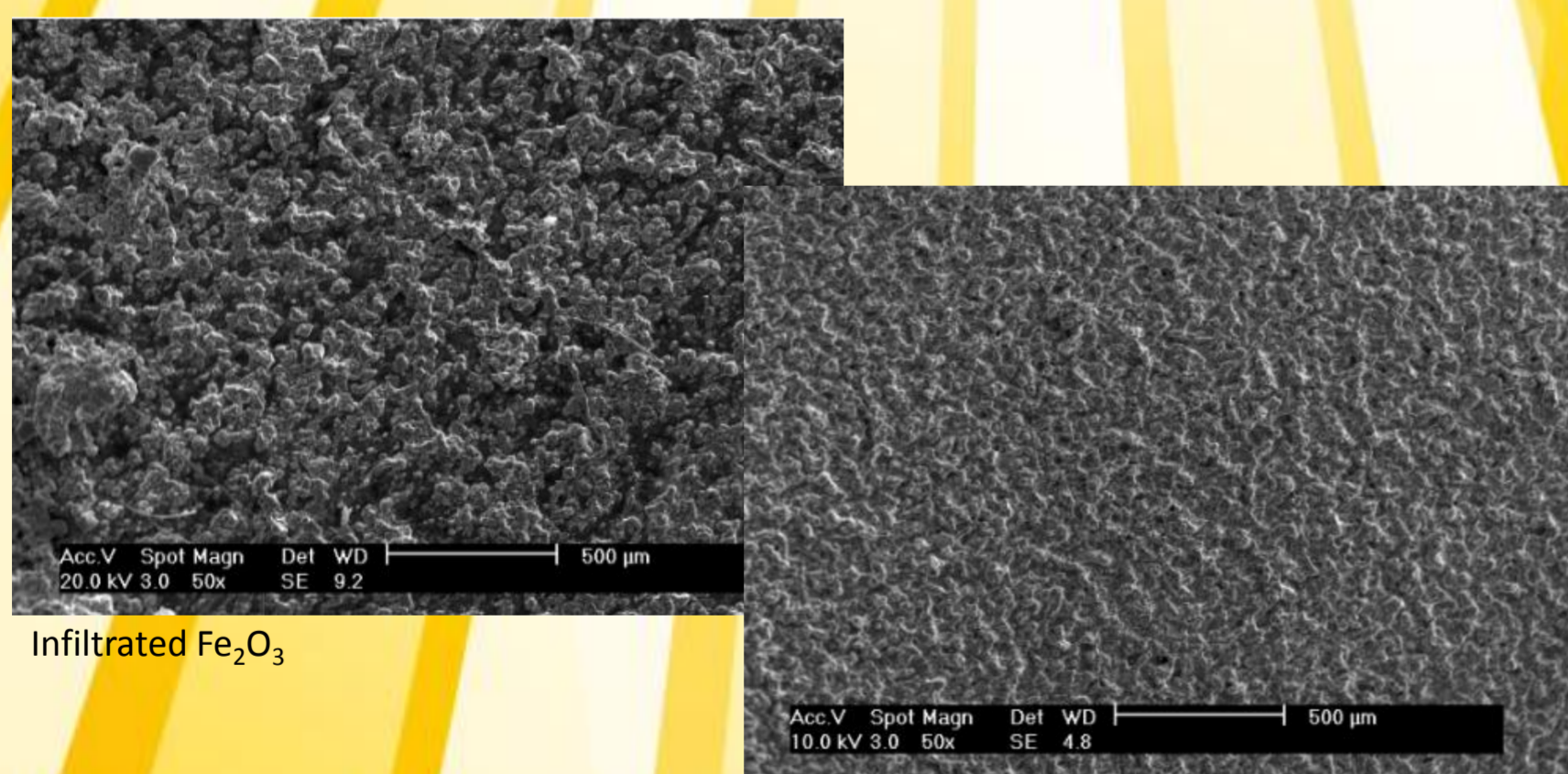
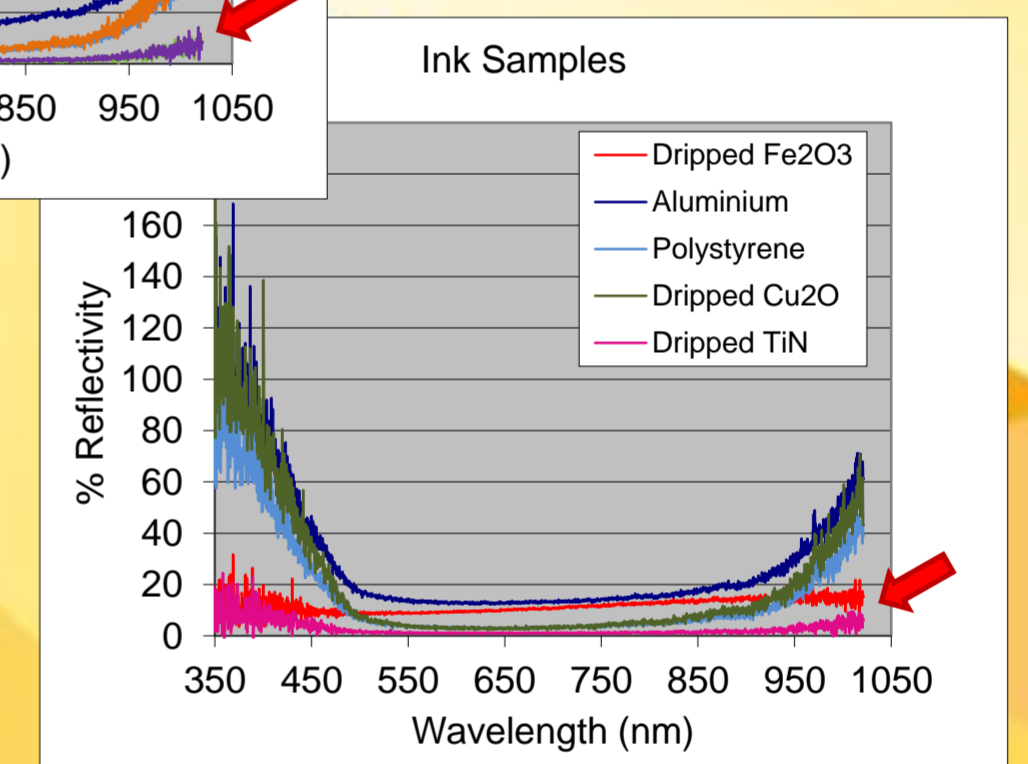
Majority of high intensity solar radiation has wavelength between 350 and 1100nm. Adsorption of radiation in this range was examined for each solar coating.

Spectral and Thermal Testing

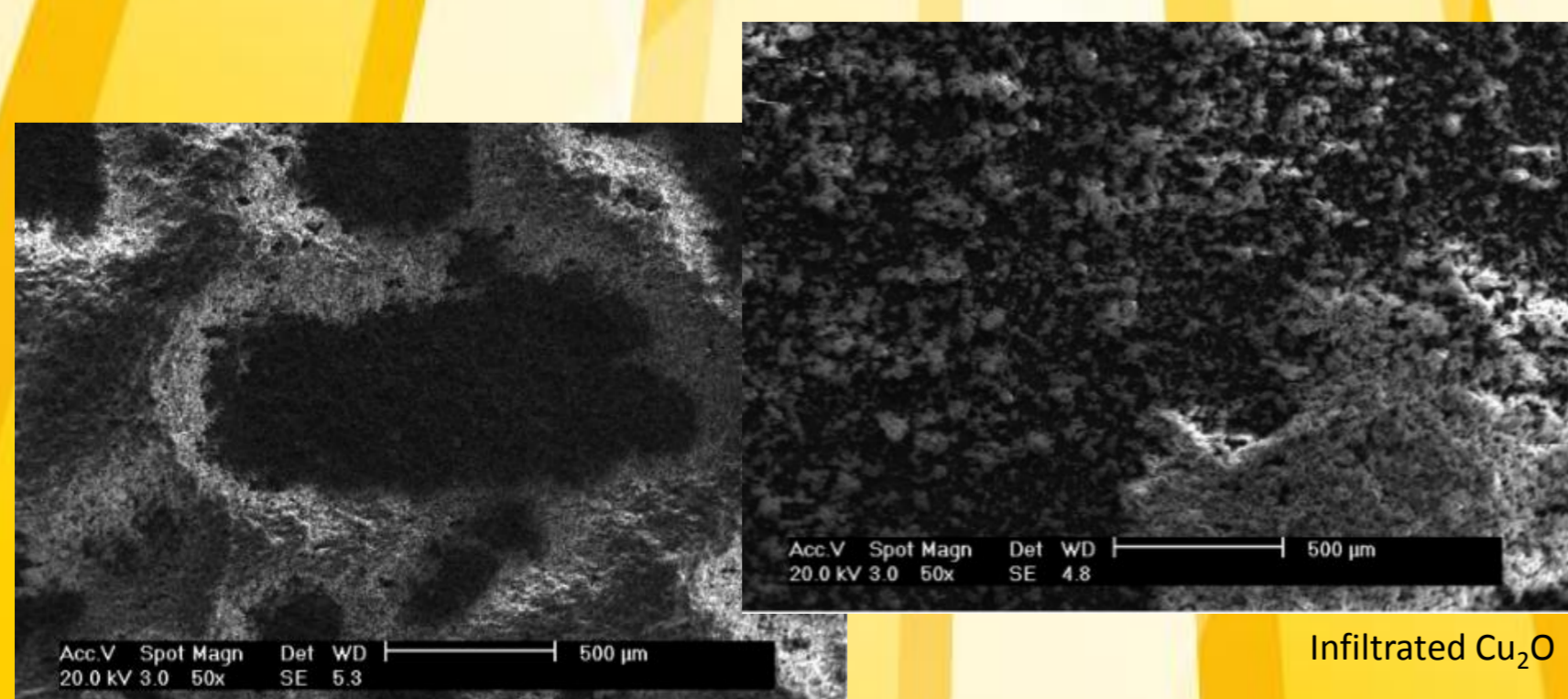
Performance of solar absorbing coatings were evaluated via a spectral and thermal test. Results showed that the magnetite and titanium nitride absorbed more incident radiation than copper oxide.



Fe₂O₃ & TiN reflect the least amount of light.



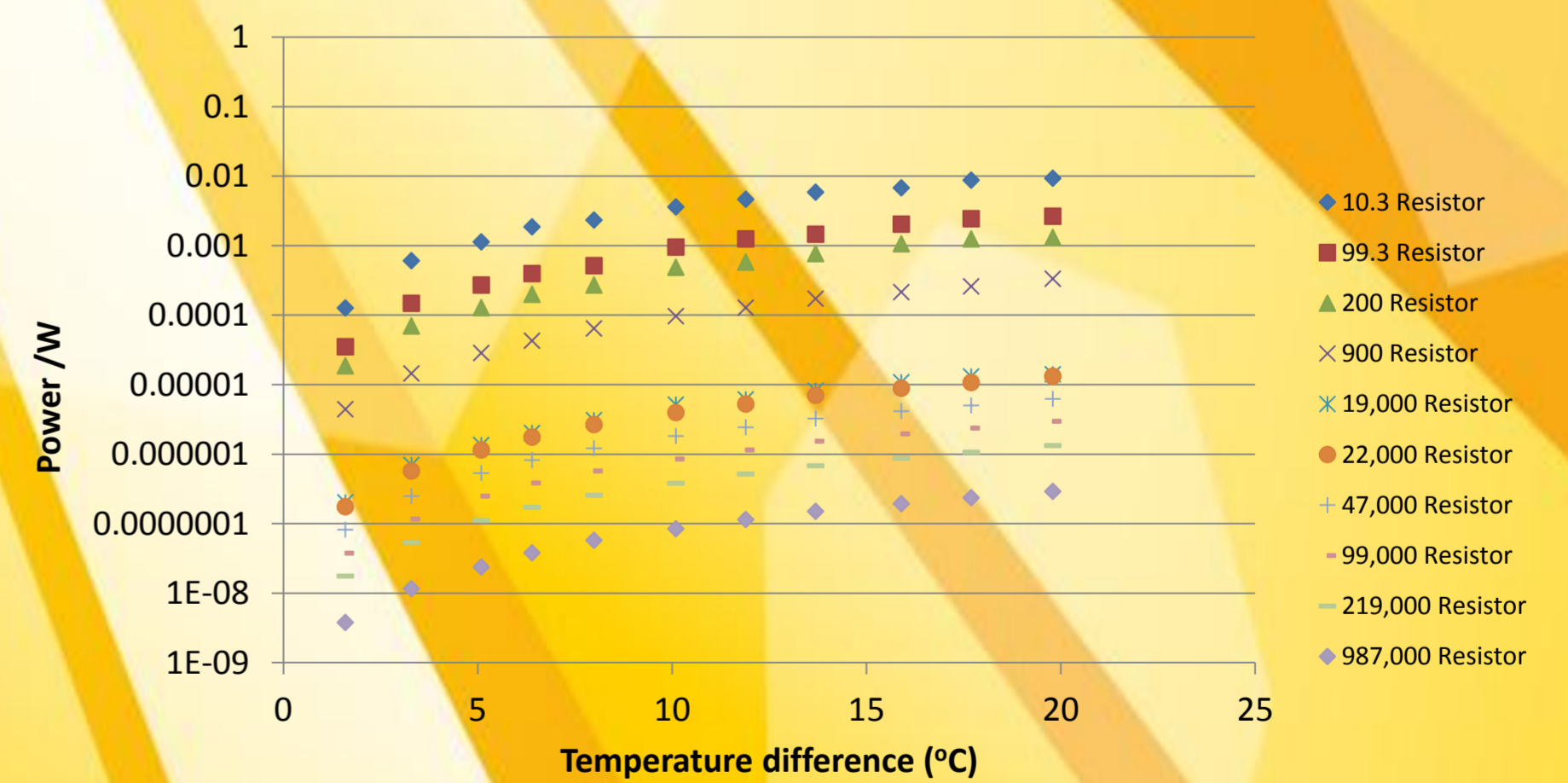
Coating microstructure



Infiltrated TiN

Solar absorbing coatings examined under a scanning electron microscope show uniform deposition.

Thermoelectric test data



Thermal testing shows that the maximum temperature of the solar absorbing structure achieved was 70°C. This allows a temperature difference of 45°C to be generated across the thermoelectric device.

From the thermoelectric test data this indicates that in excess of 10mW can be generated using a 2cm x 2cm thermoelectric unit.

Application of coating doubled the heat adsorption performance of thermoelectric power harvesters

- With no coating, a temperature of 45°C was attained.
- With coatings, temperatures in excess of 70°C were attained.