Solar Absorbing Nano Coatings

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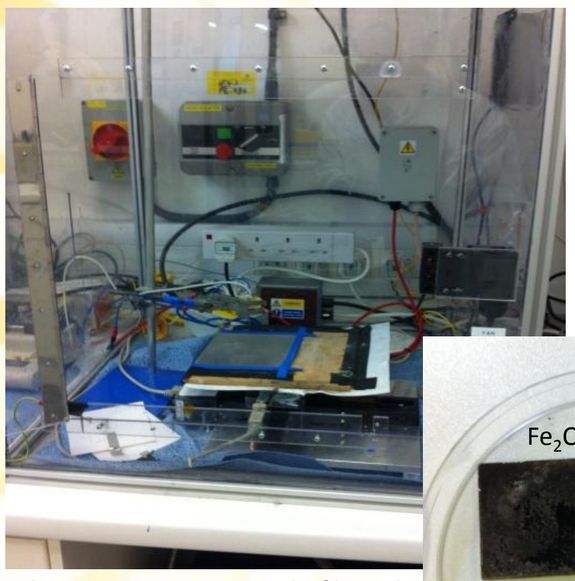
The aim of this project was to develop a solar absorbing coating that could be applied to a variety of substrates.

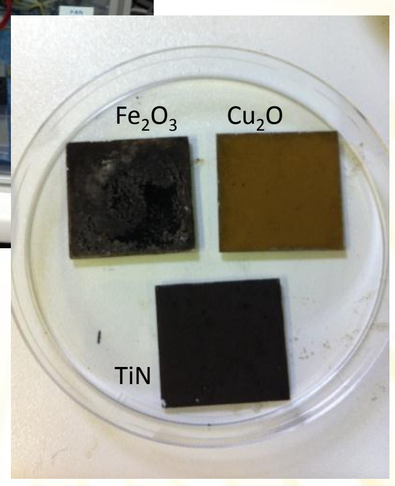
Coating deposition

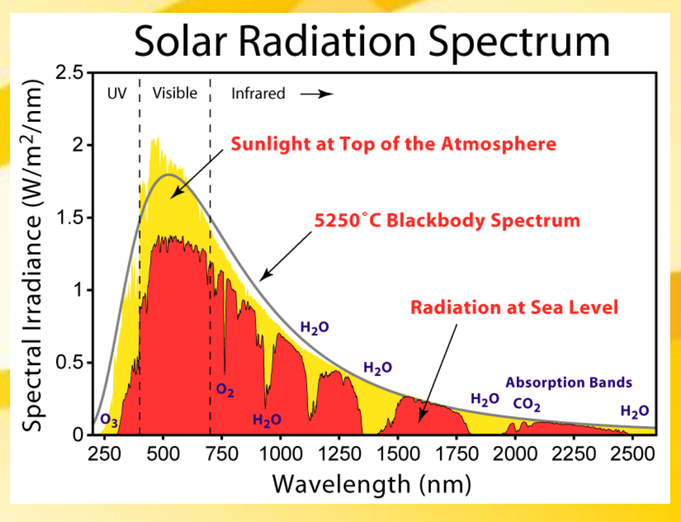


Electrospray equipment and infiltrated samples

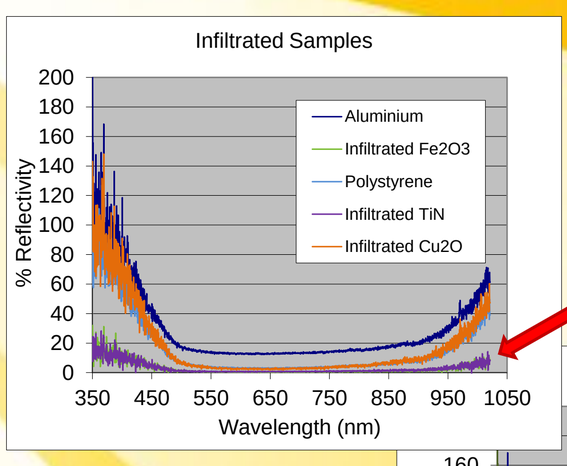
Nano inks deposited by:

- Electrospray
- Infiltration into a polymer network
- Spreading

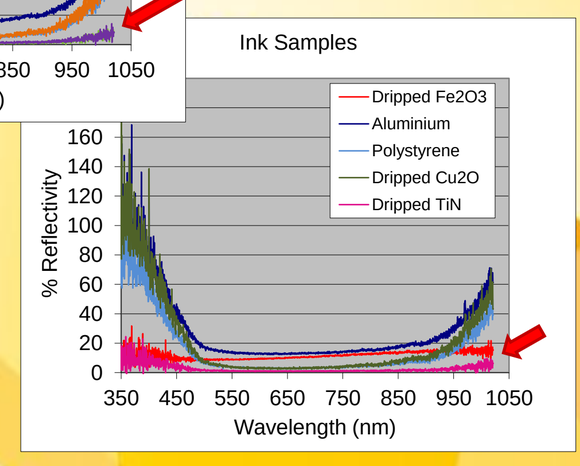




Majority of high intensity solar radiation has wavelength between 350 and 1100nm. Adsorption of radiation in this range was examined for each solar coating.

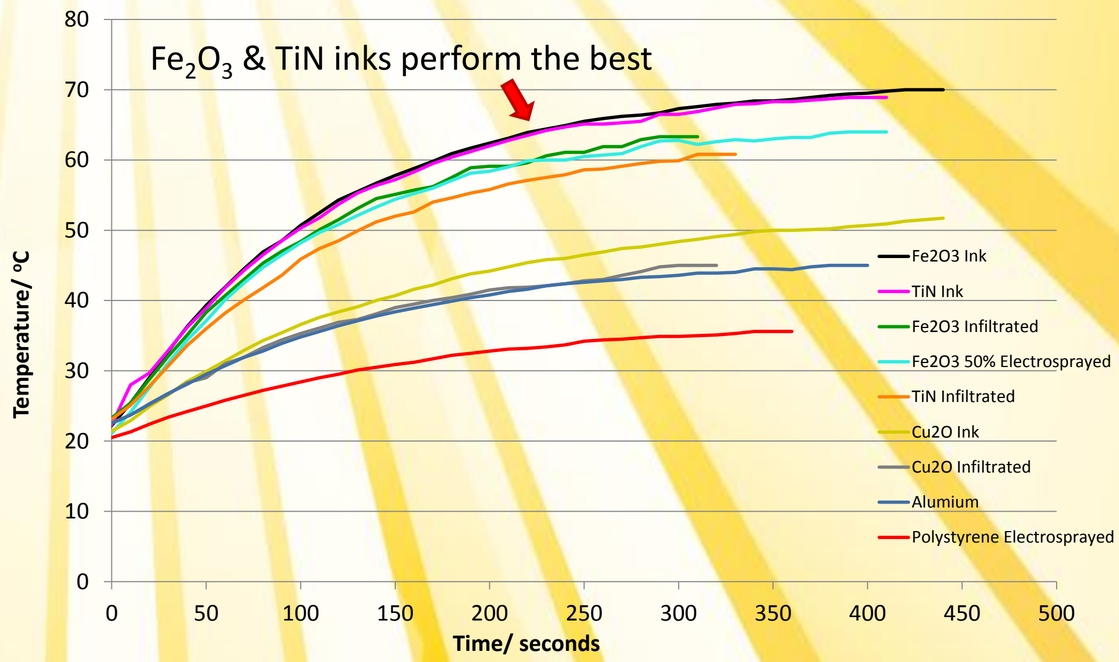


Fe_2O_3 & TiN reflect the least amount of light.

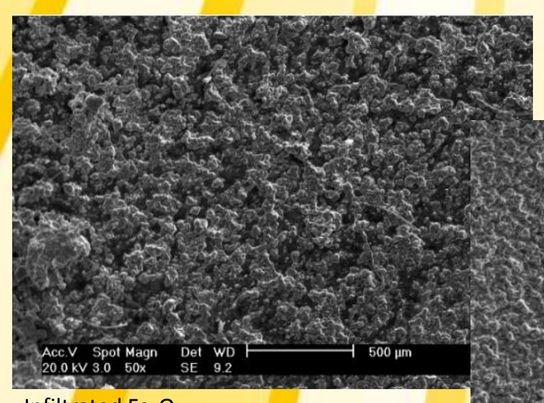


Spectral and Thermal Testing

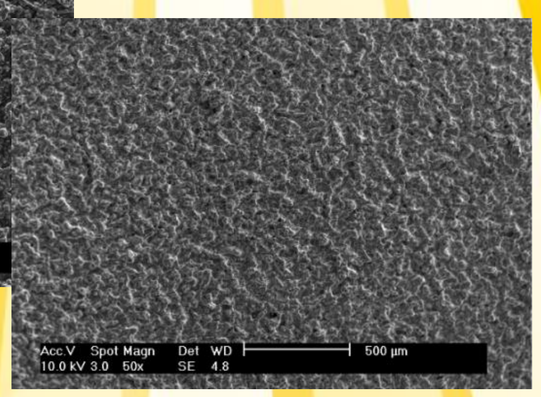
Performance of solar absorbing coatings were evaluated via a spectral and thermal test. Results showed that the magnetite and titanium nitride absorbed more incident radiation than copper oxide.



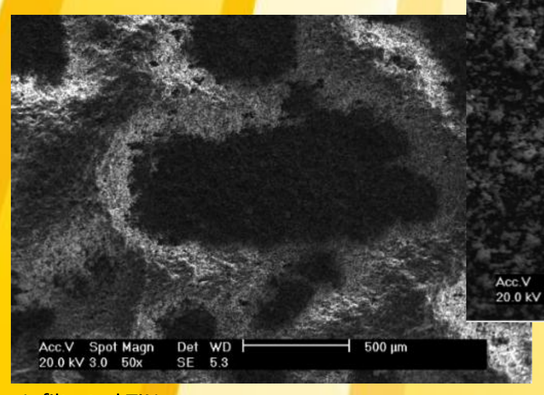
Coating microstructure



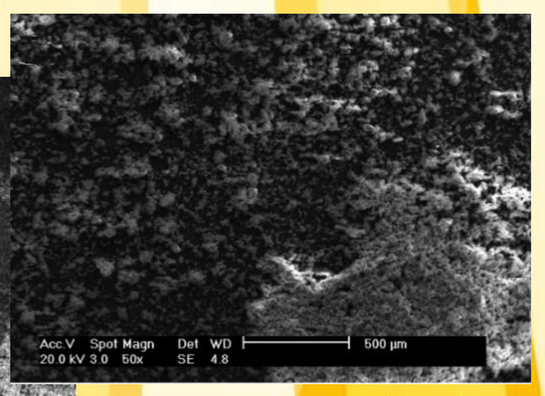
Infiltrated Fe_2O_3



50 vol % Electrosprayed Fe_2O_3



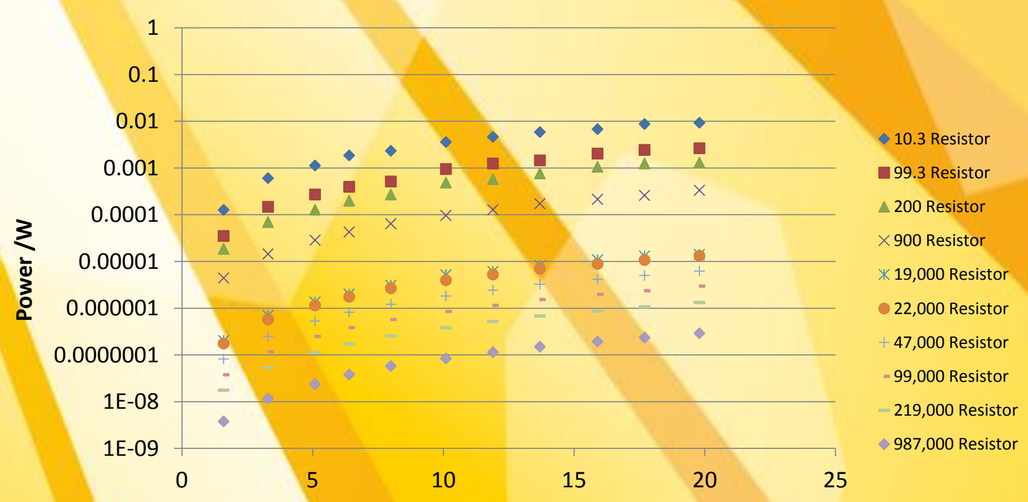
Infiltrated TiN



Infiltrated Cu_2O

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.

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