UV dosimetry for SODIS

June, 2013

Mills group member Katherine Lawrie visited a research group at the University of Cadiz, Spain, as part of a collaboration aimed at creating a colourimetric UV dosimeter for solar water disinfection (SODIS). We want to develop a device which tells users of the SODIS method (typically those in third world countries) when a bottle has been exposed to sufficient amounts of sunshine and the water is safe for drinking.

SP4 Prague Conference

June, 2013

The 4th International Conference on Semiconductor Photochemistry (SP4), hosted by Professor Josef Krýsa of the Institute of Chemical Technology Prague was well attended by the Mills Group, with Professor Andrew Mills, two postdoctoral researchers and two PhD students representing the group.

Christopher O'Rourke and Nathan Wells both presented posters during the course of the conference, with the latter also giving a short oral presentation.

Pitch in Prague for Funding Photocatalyst Inks

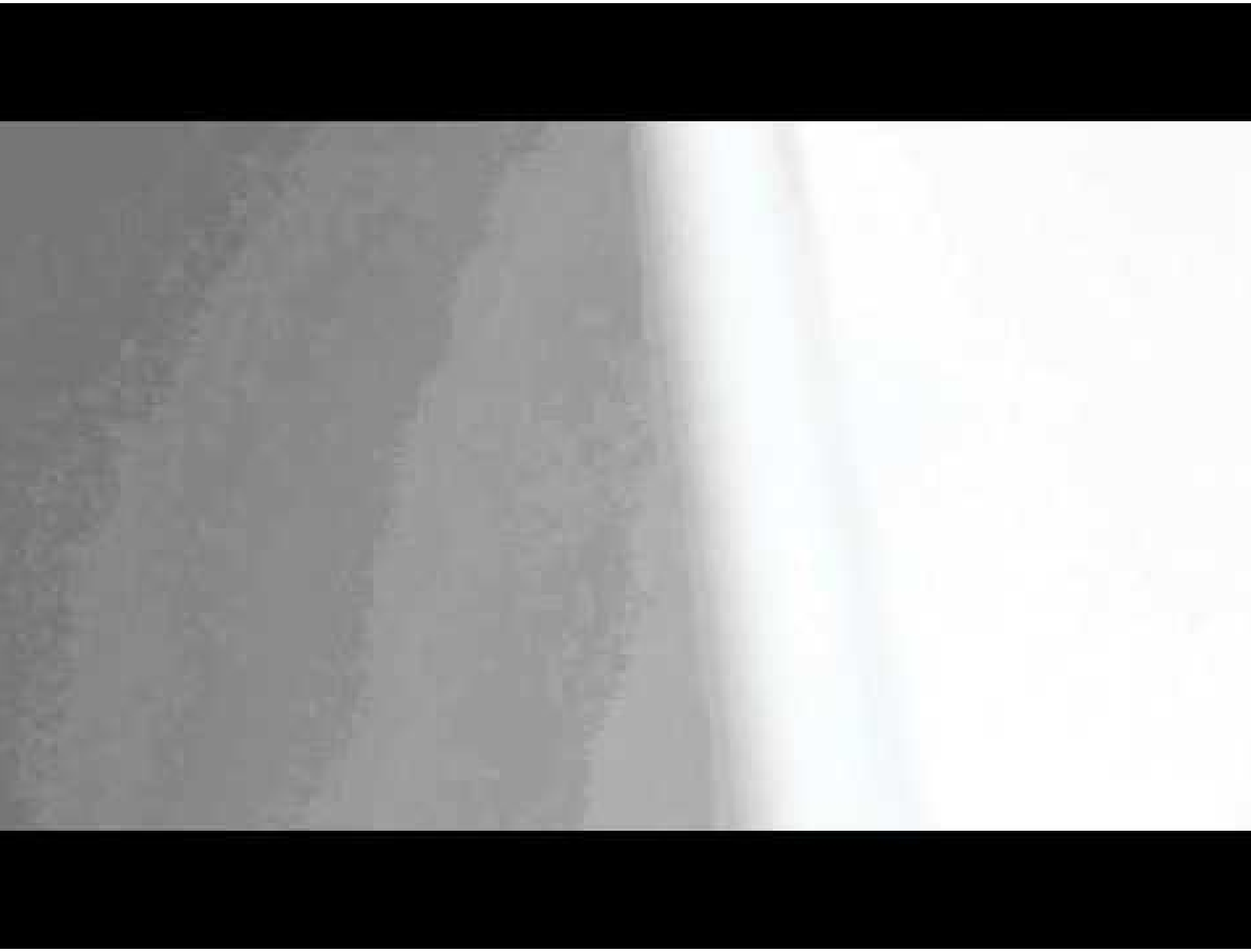
June, 2013

Video available online at http://www.youtube.com/watch?v=5LzKIcTlUTY

During a recent trip to Prague to attend the SP4 meeting on semiconductor photochemistry we found we had run out of time and needed to produce a 3 min movie for an imminent pitch for funding our photocatalyst work through InkIntelligence. So, during the conference AM went out with Christopher O'Rourke and David Hazafy and filmed various parts, in the pouring rain, in different parts of Prague. This movie was filmed on an iPhone and the sound was recoded on a separate iPhone, in AM's top pocket; Chris O'Rourke put it all together. Needless to say – we were all soaked at the end – but we did get through to the next round!

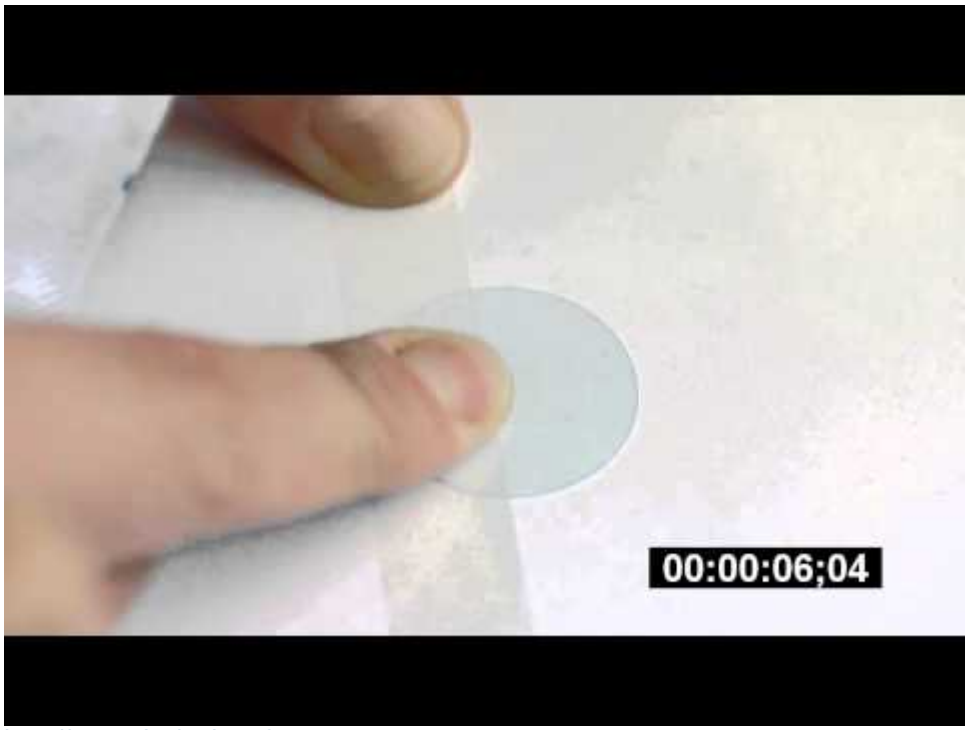
An Intelligence Ink for Oxygen

August, 2013



Video available online at http://www.youtube.com/watch?v=uhWog0X-C0E

The group has created a smart, oxygen sensitive ink, which is activated (photobleached) upon a short exposure to UVA light. In the absence of oxygen the ink stays bleached, but in its presence it recovers its original colour at a rate which is proportional to the ambient level of oxygen. The attached movie (http://www.youtube.com/watch?v=uhWog0X-C0E) shows such an ink being photobleached in air and then recovering its original colour. In the second movie (http://www.youtube.com/watch?v=EJhGTf0UEuM) a piece of tape has been attached on the ink to ensure the absence of the oxygen and to show that the indicator stays photobleached in such an environment. Currently, Lucie Nemcova is exploring exploring ways to alter the response time of this indicator from a few hundred seconds to days, by varying the encapslatiing medium. Such indicators have potential in any application where the presence or absence of oxygen is essential, such as in modified atmosphere packaging.



http://youtu.be/EJhGTf0UEuM

S-K. Lee, A. Mills and A. Lepre. An Intelligence Ink For Oxygen, Chem. Commun., 1912-1913, 2004.

Summer Studentships

September, 2013

Three undergraduate students from Queen's University of Belfast were granted summer studentships within the group, and worked on a variety of projects during their time here. Here's what they have to say:

'We spent the summer with the group assisting in research on photosensitive dyes. We mainly did work on the following:

– Testing photocatalytic indicator inks on a variety of active surfaces and testing prototype inks

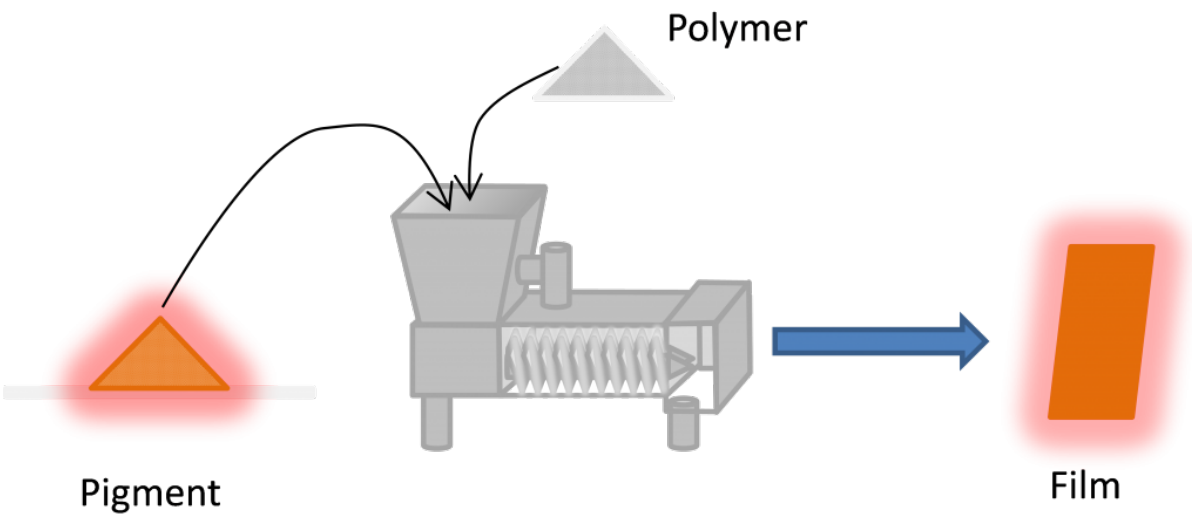
– Modifying the formulation of inks to be used in marker pens, and producing pens featuring photocatalyst test inks. The pens provide a convenient way of applying ink to a photocatalytic surface to test its activity.

– Work with indicator dyes in development for the SODIs project. The project involves the use of solar energy to disinfect water. The inks can be used to show when the water has received enough UV light to be sterilised.

We really enjoyed the experience, and look forward to putting the skills we learnt into practice in our future studies'.

Open Access Paper - Extruded polymer films pigmented with a heterogeneous ion-pair based lumophore for O2 sensing

December, 2013



A novel approach to polymeric Ru(II)-diimine luminescent O_2 sensors is described. The Ru(II)-diimine, tris (4,7-diphenyl-1,10-phenanthroline) ruthenium (II) dichloride ($[Ru(dpp)_3]^{2+}$), is first ion-paired to the surface of *heterogeneous* TiO_2 particles, rendered negatively charged due to the alkali nature of the aqueous solution, to produce an O_2 sensitive pigment with a strikingly high oxygen sensitivity (*i.e.* PO_2 (S=1/2) = 0.002 atm, where PO_2 (S=1/2) is defined as the amount of oxygen required to reduce the initial, oxygen free luminescence by 50%), and a rapid response to oxygen. The pigment is extruded in low density polyethylene (LDPE) to produce a thin (60 µm), flexible, O_2 sensing plastic film, with an O_2 sensitivity (PO_2 (S=1/2) = 0.84 atm) comparable to the more traditional *homogeneous* lumophore ion-pair based O_2 sensor ink films reported in the literature.