MICRO-CAPILLARY SYSTEMS INTEGRATING PHOTO-CONTROLLED MOLECULAR CRANES FOR METAL ION ACCUMULATION, SENSING AND RELEASE IN CONTINUOUS FLOW

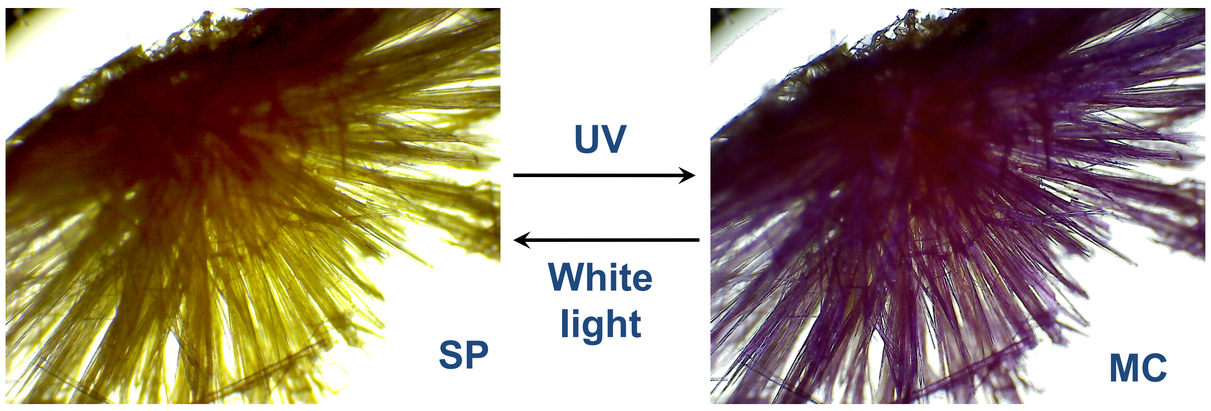
Larisa Florea, Dermot Diamond and Fernando Benito-Lopez

CLARITY: Centre for Sensor Web Technologies, National Centre for Sensor Research, School of Chemical Sciences, Dublin City University, Ireland.

INTRODUCTION

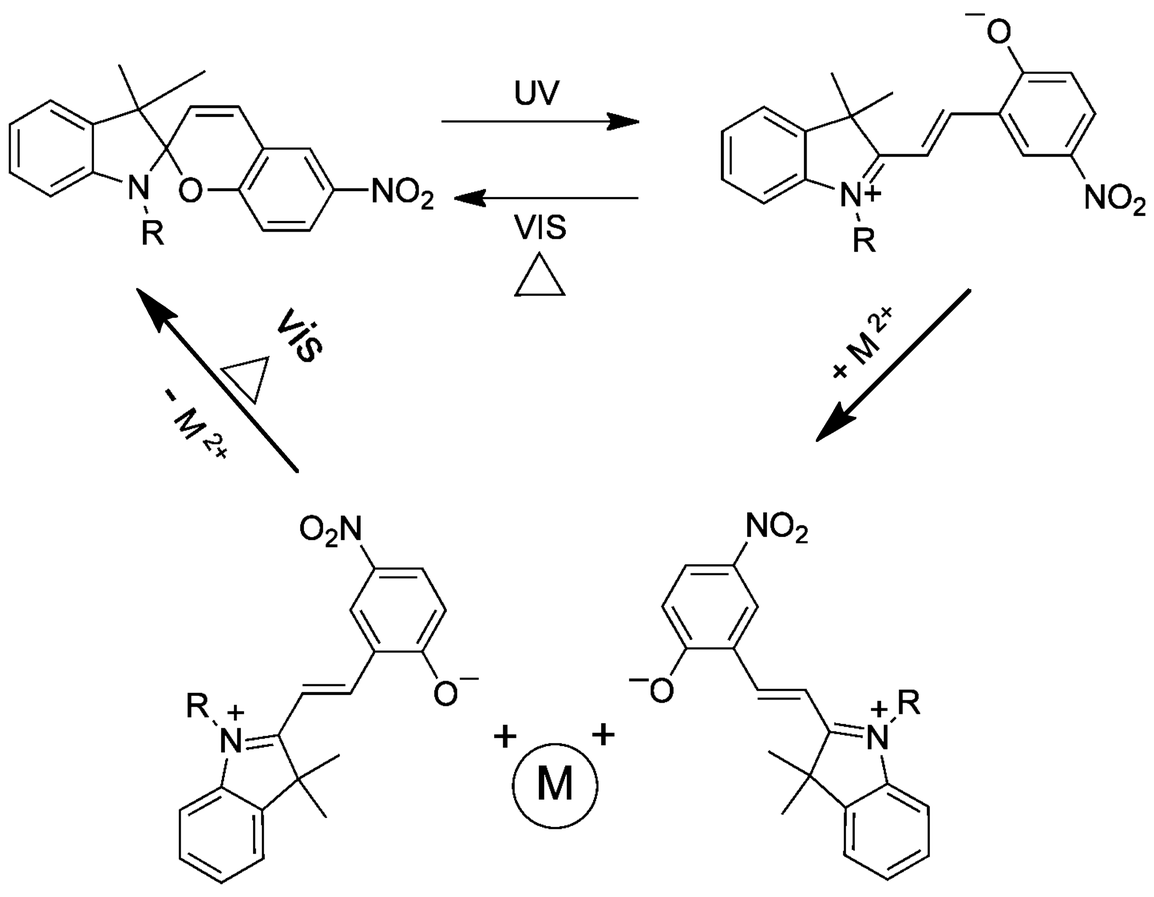
A simple and innovative photo-controlled micro-capillary system, capable of metal ion detection, accumulation and release, in continuous flow, has been realised through out the integration of the beneficial characteristics of both micro-fluidic platforms (micro-capillary) and photochromic dyes. This system involves the coating of the inner walls of fused-silica micro-capillaries with polymeric brushes based on spiropyran using the "grafting from" approach.

PHOTOCHROMIC SPIROPYRAN



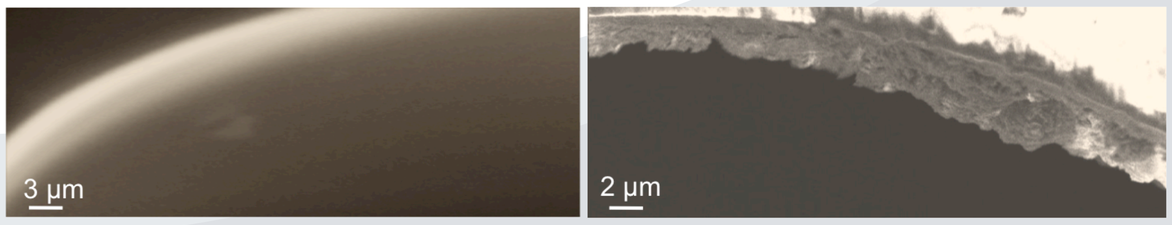
METAL IONS SENSING

Upon irradiation with UV light the passive spiropyran (SP) unit undergoes a heterocyclic ring cleavage that results in the merocyanine (MC) formation, molecular crane performance. In contrast to the uncharged and colourless spiropyran form, the MC is highly charged and can be used as ligand for other charged species.

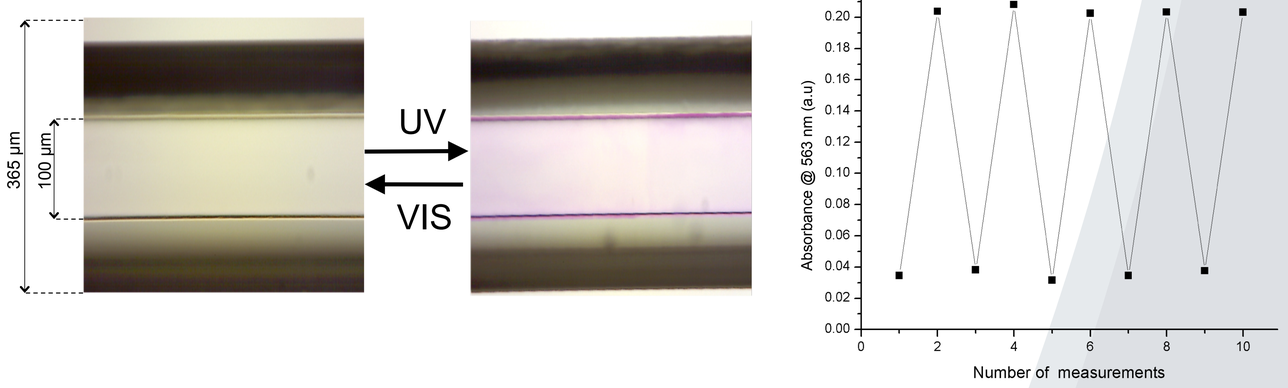


SPIROPYRAN-BASED COATINGS

Spiropyran based coating having lengths of about 2-3 µm were obtained in the interior of micro-capillaries using surface-initiated ring-opening metathesis polymerisation.

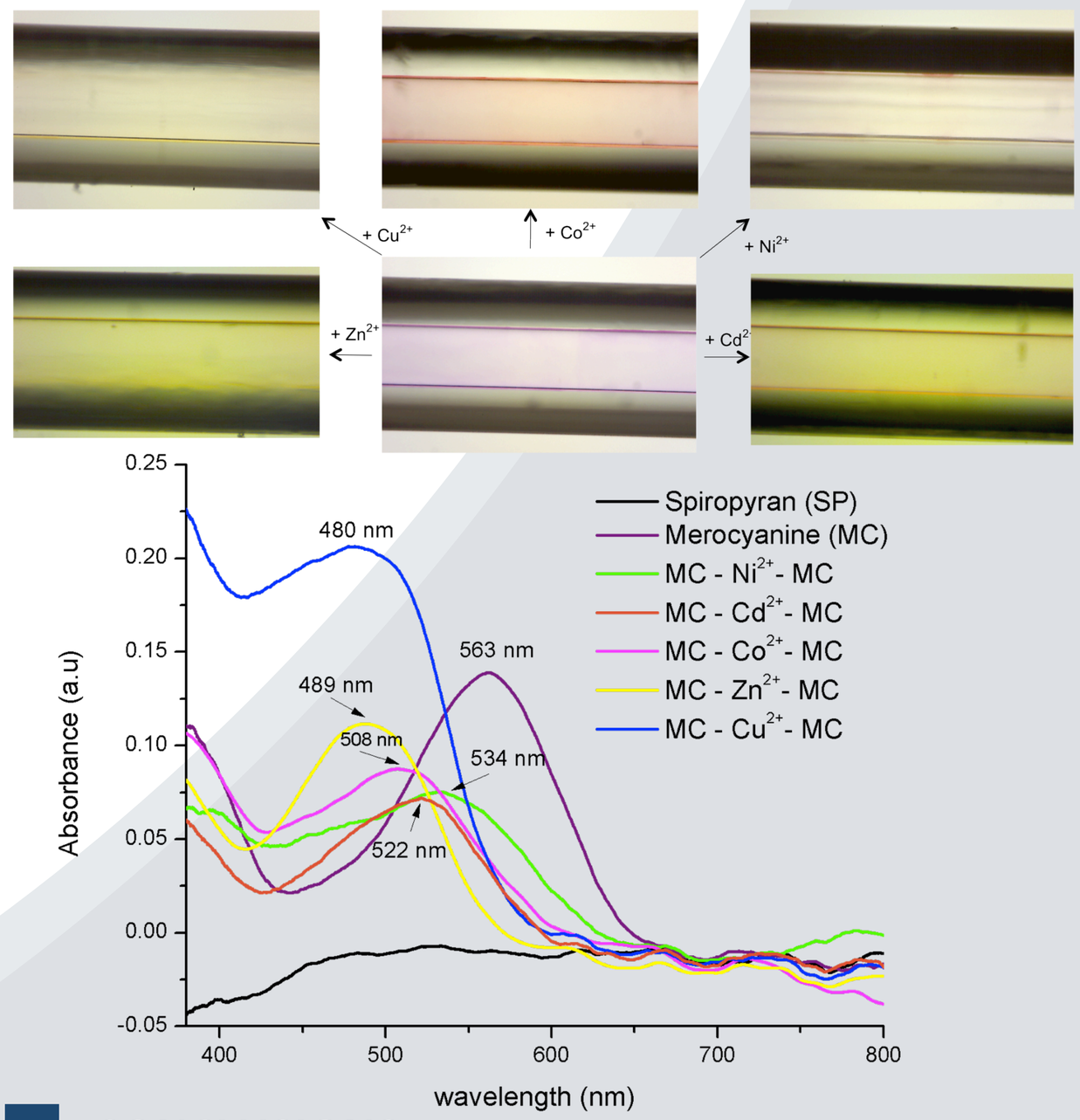


PHOTOCHROMIC COATINGS



MOLECULAR CRANE PERFORMANCE

SP-polymer brushes modified micro-capillaries are capable of detecting different metal solutions based on changes in colour (absorbance spectra) of the coating after irradiation with UV light.



CONCLUSIONS

A new, simple and innovative micro-capillary platform capable of metal ion detection, accumulation and release has been presented. The SP-polymer brushes functionalised micro-capillary acts as photonically controlled self-indicating system for metal ion detection, capable of continuous flow operation.

This material is supported by the Irish Research (IRC) – The Embark Initiative under grant 07/CE/I1147 and Science Foundation Ireland under the CLARITY award (07/CE/I1147)