Lyon 13-16 Jul 2026
4th International Symposium on Photonic and Electronic Molecular Machines

# Using supramolecular assembly to influence photochromic and electrochromic in organic systems

Nicholas R. Murray[a], Rebecca I. Randle[a], Benjamin O. Orimolade[a] and Emily R. Draper[a]

[a]*School of Chemistry, University of Glasgow, UK. Email:Emily.Draper@glasgow.ac.uk*

Abstract:

Small organic molecules have the unique potential to being chemically altered so that they may be used for many different applications, such as small wearable devices, catalysis, displays, lighting etc. On top of this they also can be assembled and processed to further tailor their properties. However, where organics often fall down in these applications is in the lifetime, cycling and robustness compared to that of their metal counterparts. However, with rapidly depleting metal resources and reports of organic devices now out performing metal ones, organics are now being taken more seriously for these applications. Our work looks at the self-assembly and processing of small molecules functionalised with amino acids in water for different organic electronic applications. We are aiming to address the issues that can let organic devices down when compared to metal-based electronics. The Draper group has focused on perylene bisimides, and naphthalene diimides and using them in applications such as photoresponsive and electrochromic devices. We have found that the aggregation of the molecules in water has a huge influence on the behaviour of the final materials, such as conductivity, colour, longevity and lifetime of the samples, and so in turn what they can be used for. By trying to understand the self-assembly of the molecules, and how this can be influenced by chemical structure, pH, and additives, we believe we can improve the properties of small organic materials so that they are comparable to that of their metal counterparts. We use techniques such as small angle neutron scattering, rheology, electrochemistry, UV-vis absorption spectroscopy and NMR combined with computational modelling in order to try and understand how these molecules self-assemble form aggregates. This understanding gives us the unique opportunity to tailor our materials just by changing the assembly conditions.

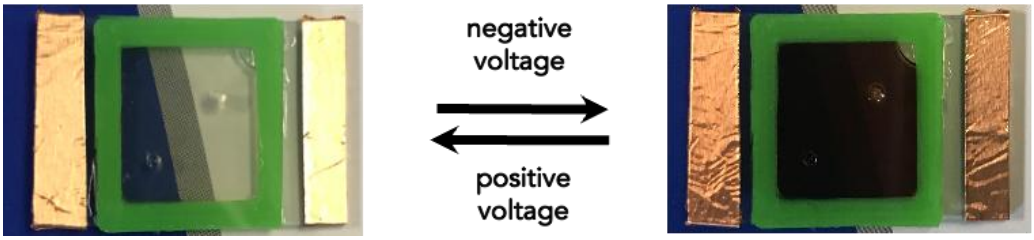


*Figure 1. Photograph of a naphthalene diimide in solution, demonstrating electrochromic behaviour.*

References:

N. R. Murray, T. J. D. McCabe, M. Reid and E. R. Draper, J. Mat Chem C., 2024, 12, 12483-12490

R. I. Randle, A. M. Fuentes-Caparros, L. Cavalcanti, R. Schweins, D. J. Adams and E. R. Draper, Phys. Chem. C, 2022, 126, 31, 13427–13432

R. I. Randle, L. Cavalcanti, S. Sproules and E. R. Draper*, Mater. Adv., 2022, 10.1039/D2MA00207H

L. Gonzalez, C. Liu, B. Dietrich, H. Su, H. Cui, D. Honecker, D. J. Adams and E. R. Draper*, Commun. Chem., 2018, 1, 77