Chromo-fluorogenic sensing of carbon monoxide in air and in biological environments using organometallic probes

Prof. James Wilton-Ely

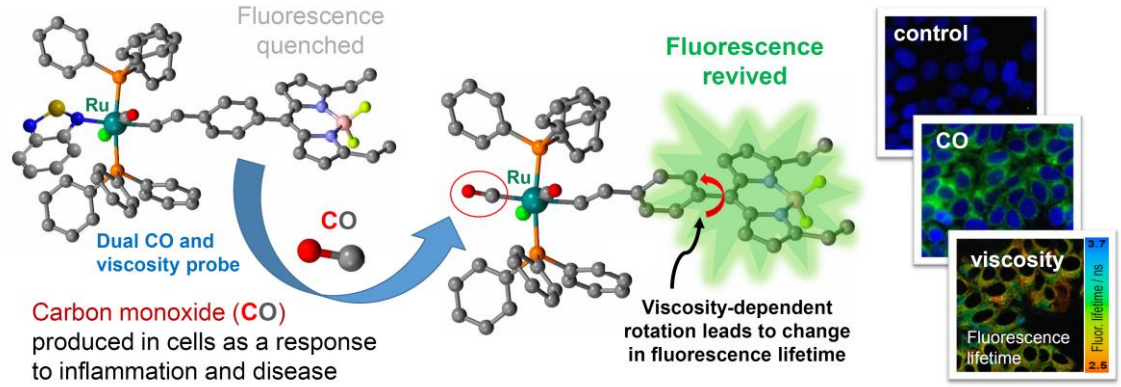
Department of Chemistry, Imperial College London

Molecular Sciences Research Hub, White City Campus, London W12 0BZ. UK

email: j.wilton-ely@imperial.ac.uk

Abstract

Exposure even to low levels of carbon monoxide (CO) is a significant health risk so it may seem surprising that CO is used in cell-signalling pathways in the body and plays a growing role in therapy.[1] Although commercial CO monitors are widespread, their sensitivity is low, partly due to the need to avoid false alarms in the presence of interferents such as steam, smoke or solvents in a domestic setting. For this reason, there is an unmet need for systems that can detect low levels of this toxic, odourless and colourless gas, before the onset of severe symptoms. Over the last 10 years, it has become clear that probes which give a colour or fluorescence response are ideal for the detection of low levels of CO.[1] Using this approach, colorimetric detection strips bearing immobilised probes have been shown to offer a promising solution, either on their own or as part of an optoelectronic device.[2,3] The role that CO plays in regulating cellular processes, in particular in response to inflammation or disease, has provided further impetus to the design of probes for this analyte. Most probes are based on palladium but this presentation will demonstrate the many benefits of ruthenium(II) systems in terms of sensitivity, selectivity, rapid detection and flexibility of design.[4] The extension of this approach to the combined sensing of CO and viscosity (also a marker of disease) in cells will also be discussed (as shown below)[5] before the presentation concludes with the development of bimetallic and targeted probes.



Dual modal detection of carbon monoxide and viscosity using ruthenium(II) complexes.

References

[1] A. Toscani, C. Marín-Hernández, F. Sancenón, J.D.E.T. Wilton-Ely, R. Martínez-Máñez, *Chem. Commun.* 52 (2016), 5902.

[2] M.E. Moragues, A. Toscani, F. Sancenón, R. Martínez-Mañez, A.J.P. White, J.D.E.T. Wilton-Ely, *J. Am. Chem. Soc.* 136 (2014) 11930.

[3] J. García-Calvo, J.A. Robson, T. Torroba, J.D.E.T. Wilton-Ely, *Chem. Eur. J.* 25 (2019) 14214.

[4] C. de la Torre, A. Toscani, C. Marín-Hernández, J.A. Robson, M.C. Terencio, A.J.P. White, M.J. Alcaraz, J.D.E.T. Wilton-Ely, R. Martínez-Máñez, F. Sancenón, *J. Am. Chem. Soc.* 139 (2017) 18484.

[5] J. A. Robson, M. Kubánková, T. Bond, R. A. Hendley, A. J. P. White, M. K. Kuimova, J. D. E. T. Wilton-Ely, *Angew. Chem., Int. Ed.* 59 (2020) 21431.