Chemists create switchable gold catalyst

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A gold catalyst whose behaviour can be controlled by the addition of acid or metal ion cofactors has been designed by chemists from the University of Southampton.

Dr Steve Goldup, Associate Professor of Supramolecular Chemistry, and

his team have developed a catalyst with significantly enhanced properties based on a rotaxane, in which a gold catalyst is embedded in the cavity formed by threading a ring shaped molecule around a dumbell shaped axle.

On its own , the rotaxane gold catalyst is unreactive but the addition of ions that bind into a pocket in the catalyst framework leads to rapid reactions. Excitingly, different ions lead to different reaction products by changing the shape of the catalyst, a trick that nature's catalyst use to control selectivity and activity in living cells. The 'best' ion for each reaction depends on the reactants used, suggesting that this approach could be used to tailor catalysts to each desired product.

Dr Goldup said: "We applied our efficient methods for the synthesis of rotaxanes to a novel gold complex and studied its behaviour in detail using NMR and X-ray crystallography. We chose gold catalysis for our initial experiments as it is perhaps the quintessential example of a 'hard to influence' reaction. To achieve this kind of control using more standard approaches, ligands are often very large and hard to make. Although rotaxanes are often considered challenging targets, recent advances make them extremely easy to access. As we demonstrated here, they also bring the added advantage of stimuli responsive behaviour."

Writing in *Angewandte Chemie*, a journal of the Gesellschaft Deutscher Chemiker (German Chemical Society, GDCh), Dr Goldup explains that the potential application of this work could be exciting: "We think mechanically bonded ligands have the potential to solve problems in catalysis by providing easy access to complex reaction environments. Rotaxane-based catalysts have potential applications in the development of new ways of making important compounds like drugs and electronic materials."

More information: "A Stimuli-Responsive Rotaxane–Gold Catalyst:

Regulation of Activity and Diastereoselectivity," *Angewandte Chemie*, DOI: 10.1002/anie.201505464