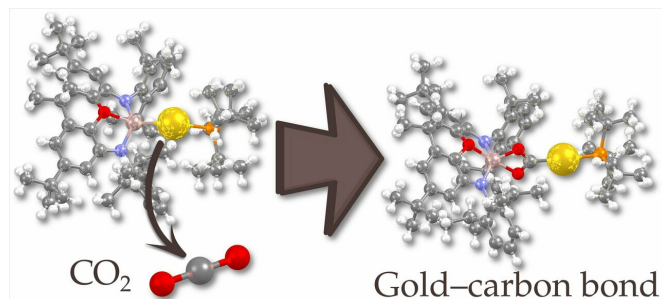


The first nucleophilic gold complex

22 January 2019



A novel aluminium-gold compound (left) reacts with carbon dioxide by insertion (right) showcasing the nucleophilic character of the gold atom. Credit: University of Jyväskylä

A collaborative research effort between the Departments of Chemistry at the University of Oxford (United Kingdom) and University of Jyväskylä (Finland) has resulted in the discovery of a gold compound exhibiting nucleophilic behaviour hitherto unknown for molecular gold. The research enables new opportunities in applying gold compounds, for example, as catalysts in novel chemical reactions.

The vast majority of transition metal [compounds](#) feature a positively charged metal ion bound to neutral or negatively charged electron donor compounds. In these complexes the metals act as electron acceptors (electrophiles). In this regard, gold is unique, being the only transition metal to give rise to a negatively charged 'naked' ion, auride, in solution or solid state. Therefore, in principle, gold can also act as an electron donor (nucleophile). However, the first example of nucleophilic reactivity by molecular gold system in solution has been reported only now.

New reaction to gold

The synthesised linear two-coordinate compound showcases an aluminium-gold bond which is highly polarised towards gold as expected based on the

much greater ability of the gold atom to attract electrons.

"This transfer of electron-rich character from aluminium to gold is highlighted by the reactivity of the complex: a reaction between the compound and carbon dioxide results in a product where the gold atom has attacked the central carbon atom," explains postdoctoral researcher Petra Vasko from University of Jyväskylä.

Gold complexes are well-known to be powerful electrophiles in many useful catalytic transformations. In addition, text-book transition metal reactivity (oxidative addition, migratory insertion, etc.) has only started to be developed for gold.

"Nucleophilic behaviour has been virtually non-existent prior to this work. Hence, these results can open up a completely new facet in [gold](#) chemistry," says postdoctoral researcher Akseli Mansikkamäki from University of Jyväskylä.

More information: Jamie Hicks et al. A nucleophilic gold complex, *Nature Chemistry* (2019). [DOI: 10.1038/s41557-018-0198-1](https://doi.org/10.1038/s41557-018-0198-1)

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