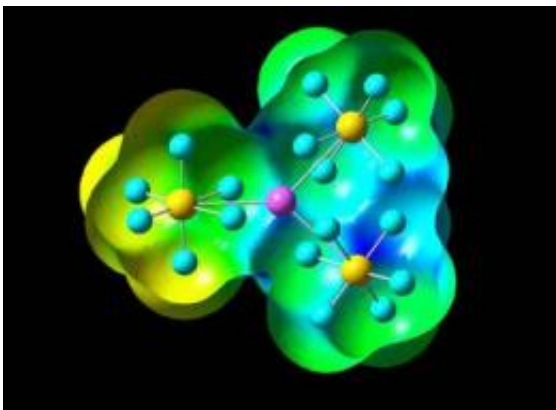


Enhancing the chemistry of zinc

June 15 2012, By Sathya Achia Abraham



Optimized structure of $\text{Zn}(\text{AuF}_6)_3$, a molecule where zinc is in the +III oxidation state. Credit: Devleena Samanta

(Phys.org) -- By tinkering with a zinc molecule, Virginia Commonwealth University researchers have discovered it can exist in a higher oxidation state, opening the door for a new form of chemistry and new composition of matter.

The [oxidation state](#) of an element is key to understanding processes in [chemistry and biology](#) including [redox reactions](#), [catalysis](#) and reaction mechanisms. For decades, chemists have been fascinated with the possibility that the group 12 elements of the periodic table, which includes zinc, [cadmium](#) and mercury, could exist at a higher oxidation state. Previously, scientists had found mercury to exist in the +IV oxidation state, but have never shown that zinc, being much lighter in weight compared to mercury, could exist beyond the +II oxidation state.

A new series of theoretical work by Puru Jena, Ph.D., distinguished professor of physics at VCU, and his graduate student Devleena Samanta, shows that ‘higher and unusual oxidation states of metals can be achieved using ligands with large electron affinities such as superhalogens.’

In the study, Jena and Samanta demonstrated that by using specific ligands that satisfy two important criteria – high electron affinity and no tendency to coalesce – unusually high oxidation states of elements can be stabilized. The discovery was published online last month in the *Journal of the American Chemical Society*.

“Our new findings open the door for a new kind of chemical reaction, and therefore new chemistry,” said Jena.

“We believe that our work provides a new perspective on how to manipulate oxidation states and therefore one can imagine tremendous applications of this in all sphere of chemistry and material science,” said Samanta.

Provided by Virginia Commonwealth University

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