Aromatic compounds: A ring made up solely of metal atoms

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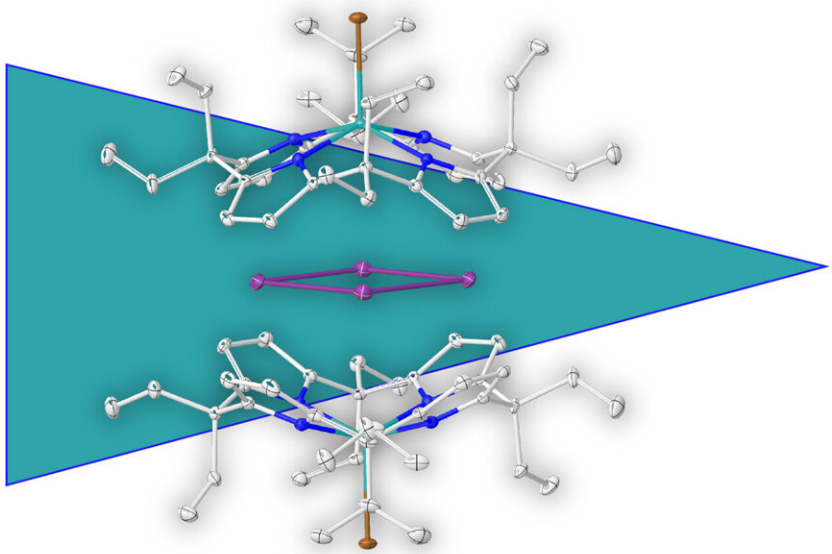

The illustration shows a first aromatic ring (purple) made up solely of metal atoms, surrounded by a molecular shell that inhibits possible decomposition reactions. Credit: Lutz Greb

The term aromaticity is a basic, long-standing concept in chemistry that is well established for ring-shaped carbon compounds. Aromatic rings consisting solely of metal atoms were, however, heretofore unknown.

The research team led by Prof. Dr. Lutz Greb, a scientist at Heidelberg University's Institute of Inorganic Chemistry, recently succeeded in isolating such a metal ring and describe it in full in an article published in the journal *Nature Chemistry*.

Aromatic compounds, or aromatics, are a substance class in organic chemistry, named after the aromatic smell by which the initially discovered compounds of this class were identified. In addition to ring-shaped carbon compounds, aromatic metal complexes are also known, whereby the metal atom is bound to an aromatic organic molecule.

The metal ring described by the Heidelberg University chemists is different. It is made up solely of metal atoms of elemental bismuth. The isolation and characterization of this metal ring was made possible by a new approach of supramolecular stabilization.

Greb's research group arranged a negatively charged molecular shell around the positively charged metal ring that inhibits possible decomposition reactions.

"We assume that our approach can be used as a general method in other areas of stabilization of positively charged rings and cages. First of all, aromatic compounds consisting solely of metal atoms aid our fundamental understanding. However, several unexpected effects of our work point to a new basic concept in the field of aromaticity.

"It could be significant for charge transport in metals," says Greb, who heads up the research group in molecular main group chemistry at the Institute of Inorganic Chemistry.

More information: Ravi Yadav et al, Supramolecular trapping of a cationic all-metal σ-aromatic {Bi4} ring, *Nature Chemistry* (2024). DOI: 10.1038/s41557-024-01530-z

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