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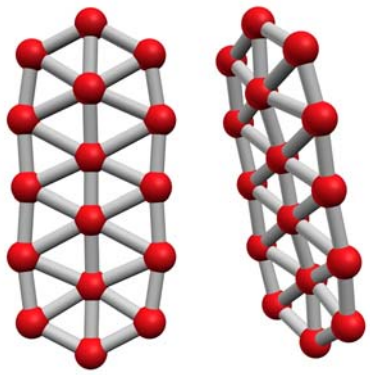
Scientists Discover All-Boron Naphthalene

Photoelectron spectroscopy at EMSL leads to discovery of B_{16}^- and B_{16}^{-2} structures

Engineering technologies to solve energy or security issues benefit from knowledge of the atomic-level structure of materials such as highly reactive boron. Recently, scientists from Utah State University, Washington State University, and Pacific Northwest National Laboratory discovered the atomic structure of two boron clusters: B_{16}^- and B_{16}^{-2}.

Using laser vaporization and time-of-flight mass spectrometry at the U.S. Department of Energy's EMSL, the researchers produced the B_{16} clusters and examined them using photoelectron spectroscopy. They did theoretical calculations to compare with the experimental data and determined the cluster's structure and chemical bonding. Molecular orbital analysis indicated that B_{16}^{-2} possesses 10 π electrons and a π bonding pattern similar to naphthalene, and it can be viewed as an all-boron version of the aromatic organic molecule used in mothballs.



The structures of two 16-atom boron clusters were recently discovered by users of the Department of Energy's EMSL. The B_{16}^{-2} structure (right) has 10 π electrons and a π bonding pattern similar to naphthalene.

Scientific impact: This research provides detailed knowledge about the structure and chemical bonding in B_{16} clusters, information that was not known previously. This work furthers the scientific basis for the development of novel boron nanostructures.

Societal impact: Fundamental insights into the structure of highly reactive boron clusters provide foundational information that other researchers can build on. This information could help the design of new boron-based nanomaterials for energy or security applications.

For more information, contact EMSL Communications Manager Mary Ann Showalter (509-371-6017).

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