Chemist discovers new information about elemental boron

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Dr. Mary Anne White. Credit: Danny Abriel

Dalhousie chemistry researcher and Royal Society of Canada Fellow Dr. Mary Anne White led a team of researchers to new discoveries about boron (B), the fifth element in the periodic table.

White's research, recently published in the highly regarded German chemistry journal *Angewandte Chemie*, discovered which form of boron stable at room temperature. Before this work, it was unknown. Additionally, boron stands out among other elements because atoms in its stable form were found to be disorderly. Atomic positions in the stable structures of every other element are completely known and ordered in some way.

"Boron's stable structure has disorder, and that was surprising to learn. Nature likes things more orderly," explains White, a professor with Dalhousie's Faculty of Science. "It is especially surprising that the disordered form remains stable at very low temperatures, where matter tends to become more ordered."

Boron, while not found in its pure elemental form on Earth, is a main component of compounds such as boron nitride and boron carbide. These are the second and third hardest materials in the world, making the element one of the most useful in terms of strength and weight. Only diamond is harder but boron can withstand higher temperatures. Boron compounds are found in aerospace technology, bulletproof vests and cutting tools.

"With this research, we're providing an underpinning for better understanding of many materials and we're adding to the fundamental knowledge that's necessary for the advancement of many technologies and industries," says White. "All matter is made of elements and there are only about 90-some naturally occurring elements, with about 30 in high abundance. To find out something new about an important element is amazing."

More information: White, M. A., Cerqueira, A. B., Whitman, C. A., Johnson, M. B. and Ogitsu, T. (2015), "Determination of Phase Stability of Elemental Boron." *Angew. Chem. Int. Ed.*.

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