Researchers discover material with graphene-like properties

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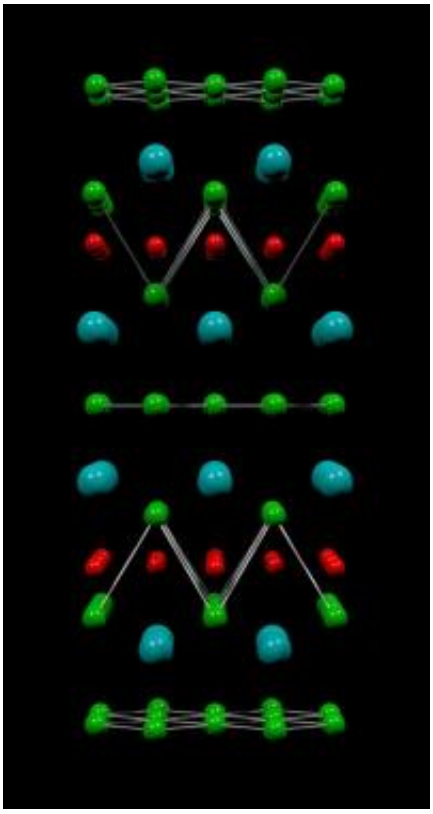

This image demonstrates how the crystal structure of SrMnBi2 resembles iron pnictides (green: bismuth; blue: strontium; red: manganese) Credit: Image courtesy of HZDR

After the Nobel Prize in Physics was awarded to two scientists in 2010 who had studied the material graphene, this substance has received a lot of attention.

Together with colleagues from Korea, Dr. Frederik Wolff-Fabris from the Helmholtz-Zentrum Dresden-Rossendorf (HZDR) has now developed and analyzed a material which possesses physical properties similar to graphene. Its structure also resembles iron pnictides, i.e. high temperature superconductors, and it definitely has a promising future: Due to the position of the individual components in the Periodic Table of Elements, some of the atoms can simply be replaced by foreign atoms. This creates new materials which can be superconductive, magnetic, or behave like topological insulators.

Earlier this year, Dr. Jun Sung Kim came from South Korea to use HZDR's Dresden High Magnetic Field Laboratory to analyze a number of material samples in high magnetic fields. For the first time ever, he and his colleague from Dresden, Dr. Frederik Wolff-Fabris, studied the metal SrMnBi2 and observed something amazing: The material consisting of the three elements strontium, manganese, and bismuth behaves physically similar to the "magical material" graphene.

Due to its composition and the position of its elements in the Periodic Table, SrMnBi2 permits simple and uncomplicated doping with foreign atoms. Inserting small amounts of foreign atoms alters the physical properties of a material. This might result in the creation of new magnets or superconductors.

SrMnBi2 is currently also in the focus of other research groups; but only the use of ultra-high magnetic fields, such as those generated in the Dresden High Magnetic Field Laboratory, permitted these precise results and, thus, a publication in the scientific journal Physical Review Letters. Later this year, Dr. Jun Sung Kim will return to Dresden to conduct additional experiments on SrMnBi2 with Dr. Wolff-Fabris.

More information: "Anisotropic Dirac Fermions in a Bi Square Net of SrMnBi2" by Joonbum Park, G. Lee, F. Wolff-Fabris, Y. Y. Koh, M.

J. Eom, Y. K. Kim, M. A. Farhan, Y. J. Jo, C. Kim, J. H. Shim, and J. S. Kim in Physical Review Letters, Vol. 107, No. 12.
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