Thorium superconductivity: Scientists discover new high-temperature superconductor
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A group of scientists led by Artem Oganov of Skoltech and the Moscow Institute of Physics and Technology, and Ivan Troyan of the Institute of Crystallography of RAS has succeeded in synthesizing thorium decahydride (ThH\(_{10}\)), a new superconducting material with the very high critical temperature of 161 kelvins. The results of their study, supported by a Russian Science Foundation grant, were published in the journal Materials Today.

The team's findings corroborated the theoretical predictions, proving that ThH\(_{10}\) exists at pressures above 0.85 million atmospheres and exhibits amazing high-temperature superconductivity. The scientists could only determine the critical temperature at 0.7 million atmospheres and found it to be \(?112\) C, which is consistent with the theoretical prediction for that pressure value. This makes ThH\(_{10}\) one of the record-breaking high-temperature superconductors.

"Modern theory, and in particular, the USPEX method developed by myself and my students, yet again displayed their amazing predictive power," said Skoltech and MIPT Professor Artem Oganov, who co-directed the study. "ThH\(_{10}\) pushes the boundaries of classical chemistry and possesses..."
unique properties that were predicted theoretically and recently confirmed by experiment. Most notably, the experimental results obtained by Ivan Troyan's lab are of very high quality."

"We discovered that superconductivity predicted in theory does exist at ?112 C and 0.7 million atmospheres," study co-director Ivan Troyan added. "Given the strong consistency between theory and experiment, it would be interesting to check whether ThH_{10} will show superconductivity at up to ?30 C, ?40 C and lower pressures as predicted."

"Thorium hydride is just one of the elements in a large and rapidly growing class of hydride superconductors," said the first author of the study, Skoltech Ph.D. student Dmitry Semenok. "I believe that in the coming years, hydride superconductivity will expand beyond the cryogenic range to find application in the design of electronic devices."


Provided by Moscow Institute of Physics and Technology


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