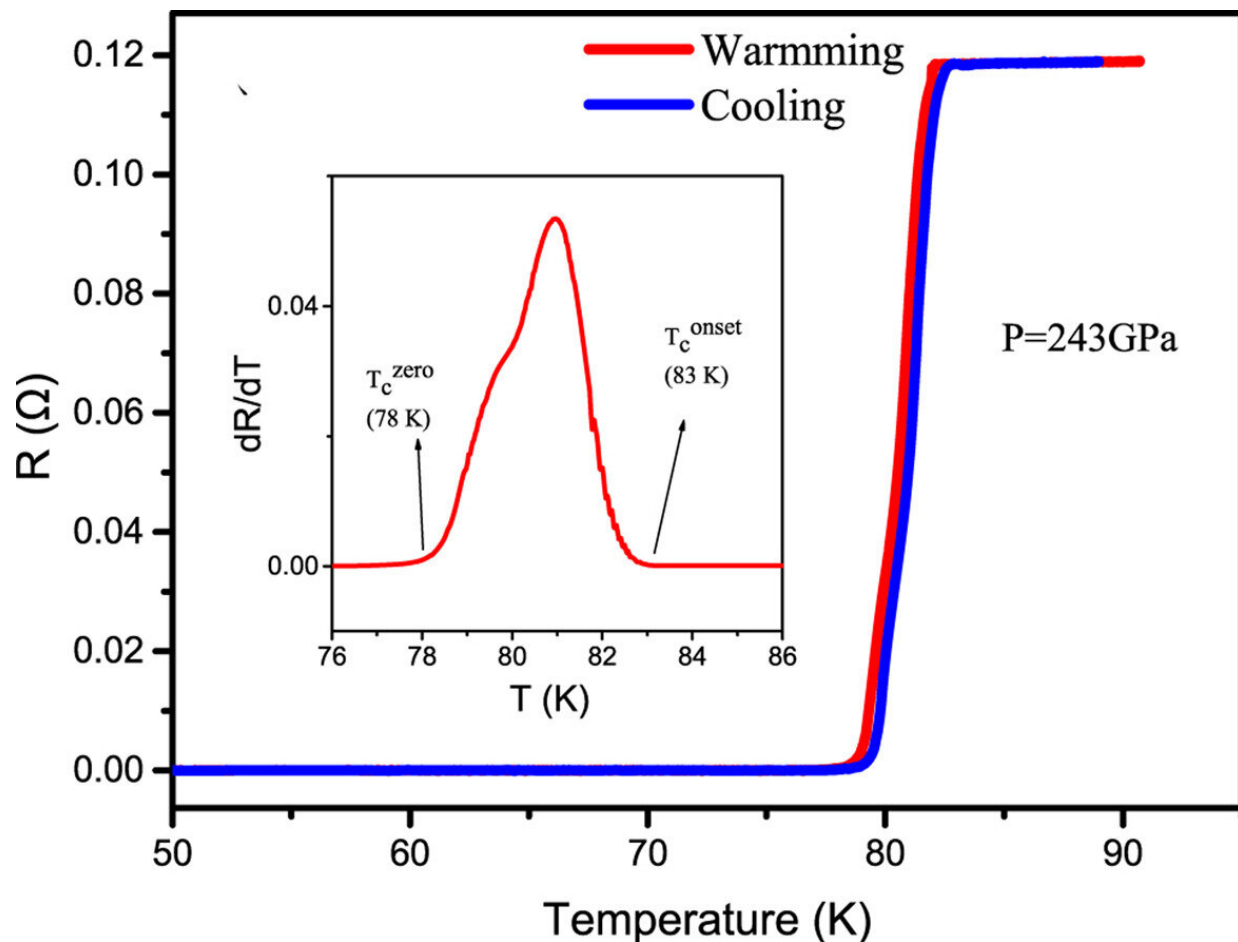


New hafnium polyhydrides superconductive above 80 K

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The discovery of high temperature superconductors in polyhydrides

encourages searching for new types of hydrogen rich superconductors. Most of experimentally reported high T_c polyhydride superconductors are binary hydrides of main group elements, rare earth metals (La, Y etc.) or alkali earth metal (Ca).

Prof. Jin team at Institute of Physics of Chinese Academy of Sciences (IOPCAS) recently discovered new hafnium polyhydrides using synergetic [high pressure](#) techniques based on diamond anvil cell in combination with in situ laser heating during a search for new types of hydrogen rich superconducting materials.

"The hafnium polyhydrides are synthesized at 243GPa and 2000 K high pressure high temperature conditions and exhibits superconductivity with $T_c \sim 83$ K at 243GPa," explained coauthor Xiancheng Wang who is a professor at IOPCAS. The upper critical field was estimated to be ~ 24 Tesla while the Ginzburg Landau superconducting coherent length obtained is $\sim 37\text{\AA}$.

This is the first experimental report on 5d transition metal hydride superconductor with T_c exceeding 80K. The new compounds can be viewed as a significant outreach of high T_c superconducting polyhydrides from alkaline earth, rare earth or sulfides based hydrides to transition metal hydrides, suggesting more superconducting [hydride](#) materials are available.

"We are trying to work on other related transition metal polyhydrides to find more potential superconductors," According to coauthor Xin He, a graduate student at IOPCAS.

"The superconducting zirconium polyhydrides are synthesized at high pressure at the moment but we are trying to sustain the superconducting samples at near ambient conditions by introducing chemical pressures," commented Changqing Jin, the corresponding author who is the team

leader at IOPCAS.

The study was published in *Materials Today Physics*.

More information: C.L. Zhang et al, Superconductivity Above 80 K in Polyhydrides of Hafnium, *Materials Today Physics* (2022). [DOI: 10.1016/j.mtphys.2022.100826](https://doi.org/10.1016/j.mtphys.2022.100826)

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