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Competition between the spin fluctuations and disorder in an iron-pnictide superconductor XIAO-JIA CHEN, YONG-HUI ZHOU, Center for High Pressure Science and Technology Advanced Research, Shanghai 201203, China, ZHU-AN XU, Department of Physics, Zhejiang University, Hangzhou 310027, China, VIKTOR STRUZHKIN, HO-KWANG MAO, Geophysical Laboratory, Carnegie Institution of Washington, Washington, DC 20015, USA — The evolution path of superconductivity with pressure in an optimally doped iron pnictide $BaFe_{1.9}Ni_{0.1}As_2$ is examined by resistance measurements. We find that the superconducting transition temperature T_c of this compound first increases with a maximum at around 5 GPa and then decreases with increasing pressure and eventually vanishes at around 12.5 GPa. The change of the strength of the spin fluctuations, derived from the analysis of the temperature-dependent resistance, behaves in a similar way to T_c. After the destruction of superconductivity, the compound enters an insulating state due to the disorder-induced localization effect. These findings unveil that the superconductivity is controlled by the competition between the spin fluctuations and disorder and pin down the nature of the electron scattering and pairing in iron-based superconductors.

Xiao-Jia Chen
Center for High Pressure Science and Technology
Advanced Research, Shanghai 201203, China

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