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"Giant" strengthening of superconducting pairing in small metallic nanoparticles: high T_c state VLADIMIR KRESIN, Lawrence Berkeley Laboratory, YURII OVCHINNIKOV, Landau Institute of Theoretical Physics, BAOPENG CAO, MARTIN JARROLD, Indiana University, Bloomington — The study focuses on metallic nanoclusters containing N$\sim 10^2$-10^3 free carriers (e.g., Ga_{56}, Al_{45}^-). The delocalized cluster electrons form energy shells similar to those in atoms or nuclei. Under special conditions, superconducting pairing in such nanoclusters can become very strong, and they form a new family of high temperature superconductors. For realistic sets of parameters one can expect a high value of T_c (150 K) as well as strong modification of the energy spectrum. In principle, it is possible to raise T_c up to room temperature. Specific experiments aimed at detecting the phenomenon of pair correlation in nanoclusters can be proposed: spectroscopy, magnetic, and thermodynamic properties.Transition to the superconducting state of the cluster is accompanied by the peak in its heat capacity. The phenomenon is promising for the creation of high T_c superconducting tunneling networks, and hence macroscopic superconductivity.

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