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Improvement of Physical Properties in High Tc Superconductors with Pb-doping MARIA ZAREFAKIS, SANDY LAVITO, PAULO COSTA, JOHNATHAN JOHNSON, MARTIN MORALES-AVENDANO, DAVID DE LACRUZ, DOMINIQUE DAVENPORT, SUKHWINDER KAUR, MARCELLA SANTOS, TORY BEAR, LU ROSE ZHANG, CSU Stanislaus — Almost all of the high Tc superconductors (HTS) that have been explored up until now have low critical current densities, and because of this, these HTS have seen limited applications. Increasing the critical current density is of great importance if HTS are to attain wide-spread use. Previous studies have shown that Pb doping, within a certain range, can increase a superconductor's critical current density without altering the structure of the material. In order to better understand what the exact optimal lead doping range is, various ranges of Pb in superconducting $Bi_{2-x}Pb_xSr_2Ca_2Cu_3O_{11-\delta}$ compounds were prepared by the solid-state reaction method with x ranging from 0.1-0.6. HTS within this optimal lead doping range have a more stabilized crystal structure, which reduces annealing time and improves their magnetic properties, and as a result, improves their manufacturability for commercial applications. When the Pb doping process through which superconductivity is enhanced is better understood, we will be able to focus on studying physical properties of Pb-doping optimized superconductors. Any findings in this direction will contribute to the selection of superconductors that are reproducible and suitable for commercial use in electric power transportation and other high-magnetic-field applications.

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