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Isotope effect in superconducting n-doped $SrTiO_3$ ADRIEN STUCKY, GERNOT SCHEERER, ZHI REN, DIDIER JACCARD, JEAN-MARIE POUMIROL, CLINE BARRETEAU, ENRICO GIANNINI, DIRK VAN DER MAREL, University of Geneva, Department of Quantum Matter Physics, Geneva
— Since the discovery of superconductivity in n-doped $SrTiO_3$ half a century ago, this material has played a key role in modern condensed matter physics, in part for its superconducting properties but also its dielectric properties and suitability as a substrate for thin film growth of high-T_c superconductors. We report the influence on the superconducting critical temperature in doped $SrTiO_3$ of the substitution of the natural ^{16}O atoms by the heavier isotope ^{18}O. We have found a huge increase of the T_c around 50% and an enhancement by a factor ~ 2 of the critical magnetic field H_{c2} for all charge carrier densities. Such a strong impact on T_c and H_{c2}, with a sign opposite to conventional superconductors, is unprecedented. Alternative models which take into account the presence of polarons in $SrTiO_3$ or the vicinity of a quantum critical point due to ferroelectric state are now considered and discussed to explain this behavior. Indeed, the unusually large size of the observed isotope effect supports a recent model for superconductivity in these materials based on strong coupling to the ferroelectric soft modes of $SrTiO_3$.

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