

ANOMALIES IN THE ISOTOPE EFFECT AS A POSSIBLE EVIDENCE OF
A PLASMON MECHANISM FOR THE HIGH- T_c SUPERCONDUCTIVITY

E. A. Pashitskii

Institute of Physics, Academy of Sciences of Ukraine, 252650 Kiev, Ukraine

Previous research has revealed that the exponent of the oxygen isotope shift α_0 decreases with increasing superconducting transition temperature T_c in the cuprate metal oxides [1,2]. This decrease in α_0 and increase in T_c can be explained by a plasmon mechanism for high- T_c superconductivity [3,4]. This mechanism involves a Cooper pairing of light current carriers in a wide $2D$ band in the cuprate layers due to the exchange of virtual quanta of low-frequency collective excitations of the charge density of heavy carriers in a narrow $2D$ band near the Fermi level. These virtual quanta are acoustic plasmons [5], which hybridize with oxygen vibrational modes.

1. Franck J. P. et al., Phys. Rev. B44, 5318 (1991)
2. Bornemann H. J. and Morris D. E., Ibid., 5322.
3. Pashitskii E. A., Zh. Eksp. Teor. Fiz. 55, 2387 (1968) [Sov. Phys. JETP 28, 1267 (1968)].
4. Pashitskii E. A., Pis'ma Zh. Eksp. Teor. Fiz. 55, 301 (1992).
5. Pines D., Schrieffer J., Phys. Rev. 124, 1387 (1961).