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Temperature and pressure induced Cu-Fe intermetallic charge transfer in $LaCu_3Fe_4O_{12}$[1] YOUWEN LONG, ICR, Kyoto Univ., Kyoto 611-0011, Japan; IOP, CAS, Beijing 100190, China, T. KAWAKAMI, IQS, Nihon Univ., Tokyo 101-8308, Japan, Y. SHIMAKAWA, ICR, Kyoto Univ., Kyoto 611-0011, Japan — An A-site ordered double perovskite $LaCu_3Fe_4O_{12}$ was prepared at high pressure and high temperature. At ambient condition, the charge combination was proved to be $LaCu_3^{3+}Fe_4^{3+}O_{12}$. When the temperature was increased to 393 K, however, an intermetallic charge transfer was found to occur between the A-site Cu and the B-site Fe ions, giving rising to the change of charge combination from the low-temperature $LaCu_3^{3+}Fe_4^{3+}O_{12}$ to the high-temperature $LaCu_3^{2+}Fe_4^{3.75+}O_{12}$.[1,2] Similarly, at room temperature, if high pressure was applied, the Cu-Fe intermetallic charge transfer could also be induced. This charge transfer led to a first-order isostructural phase transition with sharp reduction in unit cell, negative thermal expansion and unusual softening (decreased bulk modulus). Moreover, the material experienced antiferromagnetism-to-paramagnetism and insulator-to-metal transitions accompanying with the charge-transfer transition.

[1] Y. W. Long *et al*, Nature, 458, 60-63 (2009).
[2] Y. W. Long and Y. Shimakawa, New J. Phys. 12, 063029 (2010).

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