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Crystal Structure Analysis of La_2CuO_4 Nanoparticles: High Pressure Phase Appeared under Air Pressure

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La_2CuO_4 (LCO) is an oxide material which has orthorhombic perovskite structure. Depends on temperature or pressure, its phase transition occurs[1]. It has been reported that materials with A_2BO_4 structure exhibits a wide range of magnetic and electrical properties[2]. Here, LCO nanoparticles (NPs) was successfully fabricated via sol-gel method and its superlattice structure of high pressure phase appeared under air pressure. Fig.1 (a) shows the XRD chart of the fabricated LCO NPs (accordance with JCPDS: 38-0709). Pure LCO phase is obtained and LCO superlattice peaks are detected as well at 36 and 36.4°, under air pressure. As the superlattice structure exist in the LCO, it is expected that a "new formation of unit cell" will exhibit a unique electrical and magnetic properties[3]. We also could control the particle size of LCO by varying the annealing condition. As shown in Fig.1 (b), the superlattice intensity ratio was in proportion to the LCO particle size in the range. The superlattice peaks were appeared due to the octahedron oxygen in LCO is tilted zigzag along to <110> direction.

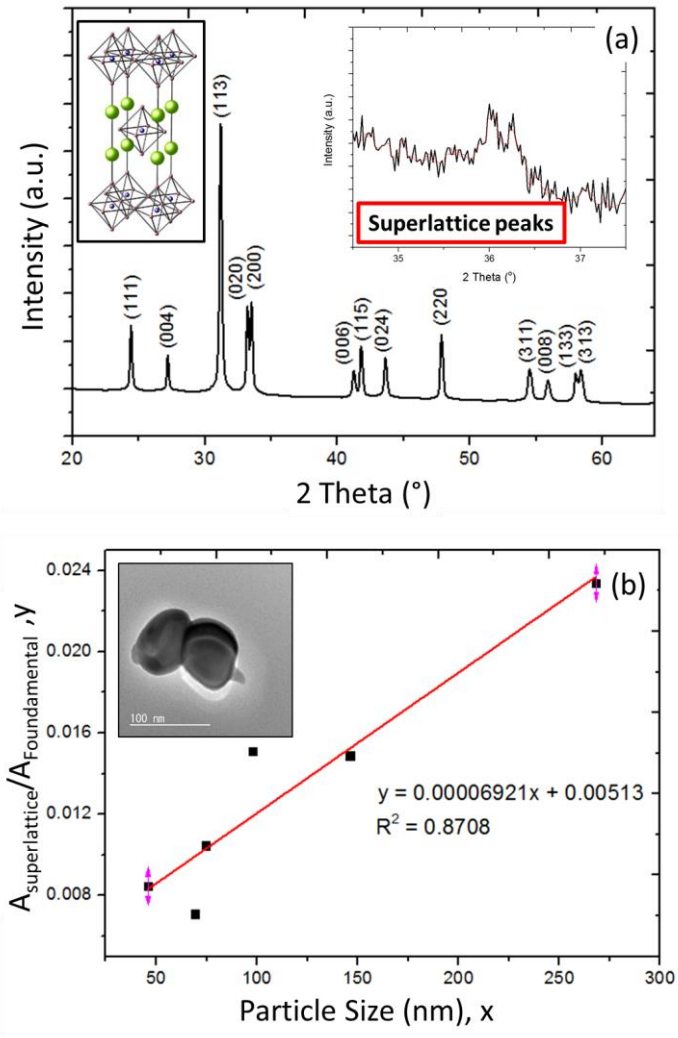

Fig. 1(a) XRD chart of LCO (inset) unit cell of original LCO, (b) relationship between the LCO particle size and superlattice intensity ratio (inset) TEM image of LCO NPs

Refs.: [1] Vaidya, S. N., Joshi, D. K., Karkhanavala, M. D., & Gopalakrishnan, I. K, *Physica status solidi 43*, K31-K35 (1977), [2] Longo, J. M., & Raccah, P. M., *J Solid State Chem. 6*, 526-531 (1973)**,** [3] Hundley, M. F., Thompson, J. D., Cheong, S. W., Fisk, Z., & Schirber, J. E. (1990). *Phys. Rev. B 41*, 4062 (1990).