

Resonant Multiple-Beam Diffraction Results of $\text{La}_{0.5}\text{Sr}_{1.5}\text{MnO}_4$

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We have used resonant multi-beam diffraction to investigate electronic configuration of strongly correlated material: $\text{La}_{0.5}\text{Sr}_{1.5}\text{MnO}_4$. The manganese forms charge ordering and orbital ordering once the temperature is below the phase transition temperature 217K [1]. We used $(3/2\ 3/2\ 0)$ as the primary reflection and found several Aulhelung-type four-beam diffraction. A more detailed research was carried out on $(0\ 0\ 0)/(3/2\ 3/2\ 0)/(1\ -1\ 0)/(5/2\ 1/2\ 0)$ OUT diffraction, which exhibits strong asymmetry whenever the incident x-ray energy is tuned away from manganese K-edge. We also used the dynamical theory of x-ray diffraction accompanied with the FDMNES software [2] to simulate the four-beam diffraction profiles. It clearly shows that the intensity of the primary reflection plays an important role on affecting the intensity distribution asymmetry which reflects the phase change due to charge ordering in the four-beam diffraction process.

[1] Y. Murakami, H. Kawada, H. Kawata, M. Tanaka, T. Arima, Y. Moritomo, and Y. Tokura, Phys. Rev. Lett. **80**, 1932 (1998)

[2] O. Bunau and Y. Joly, J. Phys.: Condens. Matter **21**, 345501 (2009).