

Raman Scattering Studies on $\text{Sr}_2\text{Nb}_2\text{O}_7$ and $\text{Sr}_2\text{Ta}_2\text{O}_7$

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New structural phase transitions were recently found in $\text{Sr}_2\text{Nb}_2\text{O}_7$ and $\text{Sr}_2\text{Ta}_2\text{O}_7$,^{1, 2)} $\text{A}_2\text{B}_2\text{O}_7$ -type compounds of perovskite slab

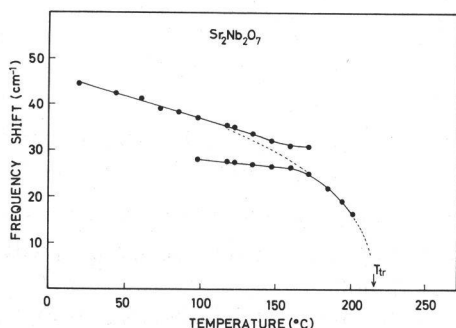


Fig. 1. Frequency shifts of the soft mode in $\text{Sr}_2\text{Nb}_2\text{O}_7$ observed by the scattering geometry $b(cc)\bar{b}$.

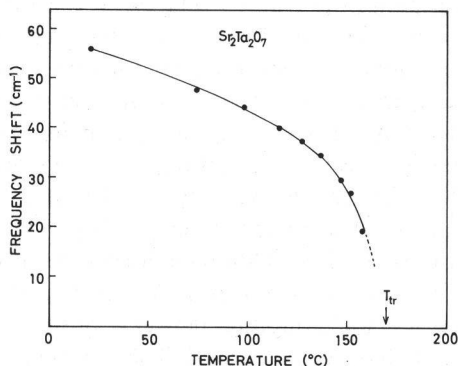


Fig. 2. Frequency shifts of the soft mode in $\text{Sr}_2\text{Ta}_2\text{O}_7$ observed by the scattering geometry $b(cc)a$.

structure. Electron-microscopic investigations found²⁾ that (1) $\text{Sr}_2\text{Nb}_2\text{O}_7$, of which point group is $mm2$ in the high-temperature phase, transforms into the incommensurate structure modulated with a wave vector $k = \pm(1-\delta)\frac{1}{2}a^*$ at about 220°C. (2) $\text{Sr}_2\text{Ta}_2\text{O}_7$, of which point group is mmm in the high-temperature phase, transforms into a superlattice structure of point group $2/m$ modulated with a wave vector $k = \pm\frac{1}{2}a^*$ at about 170°C. In the present work, these transitions are investigated by Raman Scattering measurements.

In the incommensurate phase below about 220°C of $\text{Sr}_2\text{Nb}_2\text{O}_7$, the soft optic mode, of which frequency decreases toward 215°C, has been observed in the scattering geometry $b(cc)\bar{b}$ as shown in Fig. 1. The level repulsion and the intensity transfer between the soft mode and another low frequency mode are clearly observed.

In the low temperature phase below about 170°C of $\text{Sr}_2\text{Ta}_2\text{O}_7$, the low frequency A_g -symmetry mode, of which frequency decreases toward 170°C, has been observed in the scattering geometry $b(cc)a$ as shown in Fig. 2.

References

- 1) K. Ohi, M. Kimura, H. Ishida and H. Kakinuma: J. Phys. Soc. Jpn. **46** (1979) 1387.
- 2) N. Yamamoto, K. Yagi, G. Honjo, M. Kimura and T. Kawamura: J. Phys. Soc. Jpn. **48** (1980) 185.

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