

# Anomalous low-frequency magnon in Raman spectra of NiPS<sub>3</sub>

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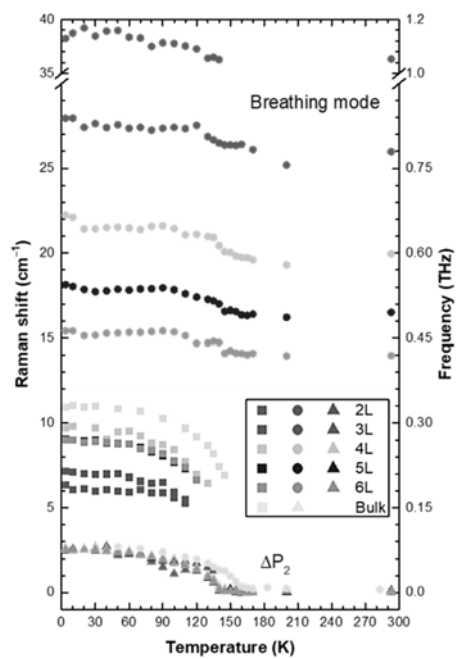
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Magnetic van der Waals materials are actively studied by researchers in various fields recently. Transition-metal thiophosphate (MPS<sub>3</sub>, M=Fe, Ni and Mn) is one of the magnetic van der Waals materials, which shows antiferromagnetic ordering in bulk below its Néel temperature. NiPS<sub>3</sub> is an XXZ-type magnetic material showing antiferromagnetic ordering below the Néel temperature, which changes depending on the thickness of the material. After the magnetic ordering of NiPS<sub>3</sub> in the 2D limit is reported, many interesting properties of 2D magnetic materials are studied.

We conducted temperature-dependent polarized Raman spectroscopy of exfoliated NiPS<sub>3</sub> samples. We measured the Raman spectra of samples from 3.5K to room temperature and analyzed the changes of the peak positions and intensities of Raman modes as the temperature increases. From a bulk crystal sample, a low-frequency peak is observed at 10 cm<sup>-1</sup>, which is not due to an interlayer vibration mode. The intensity of this peak seems to correlate with the magnetic transition. The dependence of this peak as the thickness of the sample will be presented.



**Fig. 1** Peak positions of Raman modes of NiPS<sub>3</sub> including anomalous feature around 10 cm<sup>-1</sup>.