Magnetic Excitation of Possible Spin-Peierls System TiOBr

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Newly proposed spin-Peierls system TiOX (X: Cl, Br) has been revealed showing exotic structural and magnetic properties such as a successive phase transition, one-dimensional (1D) nature associated with orbital ordering of Ti ions and super-lattice peak being related to the Peierls instability. It is pointed out that resulting only from an arrangement of Ti d_{xy} orbital, the formation of 1D spin chains and spin-Peierls transition will be realized. Recently, it has been demonstrated that TiOBr also exhibits two successive phase transitions similar to TiOCl at $Tc1$=27 K and $Tc2$=47 K.

Here we carried out inelastic neutron experiments in order to see the evidence of spin-Peierls transition. The inelastic spectrum with a large amount of poly crystalline sample of TiOBr shows the localized signal in the vicinity of the magnetic zone center. Observed spin gap like signal lies at energy of Δ $\sim$10 meV. The gap energy in TiOBr is expected much higher from measured thermodynamic properties and by analogy with TiOCl. Constant Q cuts of the observed $S(Q, E)$ map show some Q-dependent structure in its intensity indicating the signal is sample oriented. Powder averaged dynamical structure factor $S(Q, E)$ of 1D magnet can explain the Q dependence.