Complex magnetic incommensurability in multiferroic Co_3TeO_6

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Monoclinic cobalt tellurate Co_3TeO_6 has been characterized[1-3] as a type-II multiferroic, where the order parameters of electrical polarization and spontaneous magnetization are closely coupled.[4,5] In this study, polarized and unpolarized neutron diffractions have been carried out to investigate the nature of the magnetic structures and transitions in monoclinic Co_3TeO_6. As the temperature is lowered below T_{M1}= 26 K long range order develops, which is fully incommensurate (ICM) in all three crystallographic directions in the crystal. Below T_{M2} = 19.5 K, additional commensurate magnetic peaks develop, consistent with the $?_4$ irreducible representation, along with a splitting of the ICM peaks along the *h* direction which indicates that there are two separate sets of magnetic modulation vectors. Below T_{M3} = 18 K, this small additional magnetic incommensurability disappears, ferroelectricity develops, a commensurate $?_3$ irreducible representation appears, and the *k* component of the ICM wave vector disappears. Below T_{M4}= 15 K the *k* component of the ICM structure reappears, along with second-order ICM Bragg peaks, which polarized neutron data demonstrate are magnetic in origin.

References

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