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Mn/*X* (*X* = Bi, Sb) intermixing disorder in the intrinsic magnetic topological insulators $(MnX_2Te_4)(X_2Te_3)_n$ studied by X-ray diffraction and bulk magnetometry

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Van der Waals bulk heterostructures $(MnX_2Te_4)(X_2Te_3)_n$, n = 0–3, *X* = Bi, Sb, constitute a recently discovered materials platform where the instrinsic long-range magnetic order of Mn (d^5) meets a non-trivial electronic band topology [1]. An experimental observation enabled by careful single-crystal X-ray [2-4] and neutron diffraction [5, 6] studies and STM [7] is that the atomic sites in these materials are perturbed by the antisite disorder of the cations. The observed concentrations of lattice defects vary, but are, in general, considerably higher for *X* = Sb than for *X* = Bi. Consequently, strong variations in the magnetic ground state and electronic band topology have been reported for $MnSb_2Te_4$ [8–10].
We present our X-ray diffraction data on $Mn_{1-x}Bi_{2+2x/3}Te_4$, $Mn_{1-x}Sb_{2+2x/3}Te_4$, $Mn_{1-x}Bi_{4+2x/3}Te_7$ and $Mn_{1-x}Bi_{6+2x/3}Te_{10}$ taking into account the Mn/*X* antisite disorder. Then we relate it to the bulk magnetization measurements on our samples that diverge from other published results [9, 11]. We analyse the interrelation between the Mn sub-stoichiometry, the concentrations of the Mn/*X* defects and the magnetization characteristics of these magnetic topological materials. Experimental observations of the topological surface states on $Mn_{1-x}Bi_{4+2x/3}Te_7$ and $Mn_{1-x}Bi_{6+2x/3}Te_{10}$ will be discussed by Hendrik Bentmann (same session).

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