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The Dugganites: A new, frustrated, and potentially multiferroic class of compounds that exhibit rich magnetic behavior HARLYN SILVERSTEIN, University of Manitoba, ARZOO SHARMA, AVICHAI STOLLER, KANISHA CRUZ-KAN, CHRISTOPHER WIEBE, University of Winnipeg — $Ba_3NbFe_3Si_2O_{14}$ is a multiferroic langasite (s.g. $P321$) wherein the Fe^{3+} atoms (S=5/2) occupy isolated trimers that stack along the c-axis. The spins uniquely order below T_N =26 K, where single domain helicity simultaneously exists with triangular chirality. Preparations of other langasites of this type are possible, so long as Fe^{3+} remains in the trimer site leaving the magnetism relatively unchanged. This is because Fe^{3+} occupies a tetrahedral site, where most other transition metal ions prefer the octahedral site occupied by Nb^{5+}. Building on previous research, we have circumvented this problem by replacing Nb^{5+} with Te^{6+}, which is found exclusively in octahedral coordination. Isostructural compounds $Pb_3TeCo_3A_2O_{14}$ (A=V^{5+}, P^{5+}) and $Pb_3TeMn_3P_2O_{14}$ (where the only magnetic ions are Co^{2+} and Mn^{2+} respectively) have been prepared and studied. Despite being isostructural to $Ba_3NbFe_3Si_2O_{14}$, the dugganites exhibit a rich variety of magnetic behavior, including evidence for multi-k magnetic structural arrangements, long-range coexistence of static and dynamic spins, and spin-spin interactions that potentially exist over 150 unit cells. In at least one dugganite, magnetoelectric coupling was observed at T_N entertaining the possibility that these compounds may also be multiferroic.

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