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High
temperature ferroelectricity and ferrimagnetism in LnACrOsO$_6$ by design

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Despite intense efforts over the last decade, there are surprisingly few multiferroics
in which a net magnetization coexists with a switchable polarization at room tem-
perature. Since magnetism tends to be the harder problem, one approach to solve
this challenge is to start with a material that is magnetically ordered at room tem-
perature and drive it ferroelectric. In this regard, the double perovskite Sr$_2$CrOsO$_6$
is a promising candidate; it is ferromagnetic and insulating with a $T_c = 725$ K, the
highest known $T_c$ of any magnetic insulating oxide with appreciable uncompensated
magnetic moment. Here we discuss our first-principles study of the ferroic proper-
ties of as not yet synthesized 3$d$-5$d$ double perovskites, LnACrOsO$_6$ ($Ln = La, Y,$
Ce-Lu; $A = Na, K$). We identify polar compounds that have moderate polarization
switching barriers and display ferrimagnetism that is expected to persist above room
temperature.

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