The hexagonal RMnO$_3$ exhibit much higher magnetic and ferroelectric ordering temperatures, $T_N = 75$ K and $T_{FE} = 930$ K than the orthorhombic RMnO$_3$ with an incommensurate antiferromagnetic ordering below 40K. However, the coupling between the magnetic and electric order is very weak\textsuperscript{1}. We have investigated the origin of the electric order by high temperature x-ray diffraction using high energy synchrotron radiation. We discuss the change in symmetry at the ferro-electric ordering temperature, which is a few hundred degrees below the tripling of the unit cell. We show that the hexagonal manganites are proper ferroelectrics in contrast with what has been reported until now\textsuperscript{2}. Additionally, we have used magneto-capacitance measurements to study the coupling between the magnetic and electric order. We report large enhancements of the coupling by Ga substitutions in hexagonal RMnO$_3$\textsuperscript{3}.

[1] The origin of ferroelectricity in magnetoelectric YMnO$_3$,
[2] Symmetry changes at the ferroelectric transition in multiferroic YMnO$_3$,
[3] Tuning of the magneto-ferroelectric coupling in Y(Mn,Ga)O$_3$,
   A. Nugroho, T.T.M. Palstra, to be submitted.