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**Multiferroic states in perovskite type orthoferrites** YUSUKE TOKUNAGA, ERATO-JST, SATOSHI IGUCHI, The Univ. of. Tokyo, YASUJIRO TAGUCHI, CMRG, RIKEN, TAKAHISA ARIMA, Tohoku Univ., YOSHINORI TOKURA, ERATO-JST, The Univ. of Tokyo, CMRG, RIKEN — Versatile and gigantic magnetoelectric (ME) phenomena have been found for a single crystal of perovskite-type orthoferrite $DyFeO_3$[1]. Below the antiferromagnetic ordering temperature of Dy moments, a linear ME tensor component as large as $\alpha_{zz} \sim 2.4 \times 10^{-2}$ in dimensionless CGS unit is observed. In addition, it is revealed that the application of magnetic field along the c axis induced a ferroelectric order whose large polarization ($\geq 0.2$ $\mu$C/cm$^2$ along the $c$-axis) can be directly reversed by either of magnetic field or electric field. It is noteworthy that this magnetically driven ferroelectric state is even weakly ferromagnetic, i.e., truly multiferroic, in nature. We propose here that the exchange striction working between adjacent $Fe^{3+}$ and $Dy^{3+}$ layer with the respective layered antiferromagnetic components can be the origin of the ferroelectricity with such a large polarization value. It is further argued that the reversal process of electric polarization by magnetic (electric) field is inherently related to the change of the relative phase of antiferromagnetic spin (moment) arrangement of Fe (Dy)
[1] Y. Tokunaga et al., Phys. Rev. Lett. 101, 097205 (2008).

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