## Magnetic Structure of $Ba_2Mg_2Fe_{12}O_{22}$ in Ferroelectric Phase

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Recently, it has been established that the ferroelectricity is coupled with the spiral magnetic structure under an applied magnetic field. This feature can lead to a new type of storage devices, such as an electric field controlled magnetic memory. However, the magnetic field in order to switch the direction of ferroelectric polarization is too high (˜1T) for the application of multi-ferroic materials.
We focus on recently reviewed $Ba_2Mg_2Fe_{12}O_{22}$ which has a strong coupling between electric polarization $P$ and magnetization $M$. This material holds high possibility for the application, because the working temperatures are relatively high and applied magnetic fields are relatively low.
However, the detailed magnetic structure in ferroelectric phase was still unclear because of its complexity. So, we performed crystal structural and precise magnetic structural analyses of $Ba_2Mg_2Fe_{12}O_{22}$ under a magnetic field ($T$ = 4K, $H$ = 0.3T) using 4 circle neutron diffractometer (FONDER) at JRR-3M Tokai. We collected 109 points of magnetic scattering for $q$= (003/2) and over 150 points of fundamental scattering.Using these data, we determined the magnetic structure, in which 14 (Mg,Fe) sites have been included. In this conference, we propose a possible model for the magnetic origin of ferroelectricity.