

# REPORT DOCUMENTATION PAGE

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13. ABSTRACT (Maximum 200 words)  We have developed a technique to orient particles of Y-type hexaferrite in which the c-axis of the particles are oriented perpendicular to a plane . As such, that plane becomes necessarily the easy plane of magnetization. For microwave device application the easy plane of magnetization is chosen as the plane to deposit a metallic microstrip and related circuit patterns. The technique entails the rotation of an external magnetic field in the easy plane, as the particles are pressed into a disc shape. We have succeeded on the orientation of particles of $Ba_2MnZnFe_{12}O_{22}$ in an easy plane of magnetization which exhibited the following properties: $4\pi M_s=2300$ Oe, $H_a = 9500$ Oe , and $H_c = 60$ Oe , where $4\pi M_s$ is the saturation magnetization, $H_a$ the uniaxial anisotropy field and $H_c$ the coercive field. The coercive field and remanence can be varied by refiring the oriented particles . Maximum remanence of 27.5 % was obtained for refiring temperature of 1000 C . Much higher remanence is possible for thin film plane structure, where the aspect ratio exceeding 1000. These results imply that it is possible to orient the saturation magnetization in any direction within the plane of a device and the effective magnetization can be as high as 11800 Oe. The microwave properties indicate that the ferrimagnetic resonance linewidth at 27 GHz is 350 Oe and the g-factor approximately equal to 2, see fig .1. In fig.2 the vibrating sample magnetization (VSM) measurements for ZnMnY-type are shown for the external field applied parallel and perpendicular to easy plane of magnetization. We have also been working on Co <sub>2</sub> Y-type, our experiments show $4\pi M_s=2.2$ kOe, $H_a=42$ kOe and linewidth around 2000Oe at 38 Ghz. Potential microwave applications are fabrication of IC circuits and microwave ferrite devices.					
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# Oriented Y-type Hexaferrites for ferrite devices

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We have developed a technique to orient particles of Y-type hexaferrite in which the c-axis of the particles are oriented perpendicular to a plane . As such, that plane becomes necessarily the easy plane of magnetization. For microwave device application the easy plane of magnetization is chosen as the plane to deposit a metallic microstrip and related circuit patterns. The technique entails the rotation of an external magnetic field in the easy plane, as the particles are pressed into a disc shape. We have succeeded on the orientation of particles of  $Ba_2MnZnFe_{12}O_{22}$  in an easy plane of magnetization which exhibited the following properties:  $4\pi M_s=2300$  Oe,  $H_a = 9500$ Oe , and  $H_c = 60$ Oe , where  $4\pi M_s$  is the saturation magnetization,  $H_a$  the uniaxial anisotropy field and  $H_c$  the coercive field. The coercive field and remanence can be varied by refring the oriented particles . Maximum remanence of 27.5 % was obtained for refring temperature of 1000 C . Much higher remanence is possible for thin film plane structure, where the aspect ratio exceeding 1000. These results imply that it is possible to orient the saturation magnetization in any direction within the plane of a device and the effective magnetization can be as high as 11800 Oe. The microwave properties indicate that the ferrimagnetic resonance linewidth at 27 GHz is 350 Oe and the g-factor approximately equal to 2, see fig .1. In fig.2 the vibrating sample magnetization (VSM) measurements for ZnMnY-type are shown for the external field applied parallel and perpendicular to easy plane of magnetization. We have also been working on Co2Y-type, ours experiment shows  $4\pi M_s=2.2$ kOe,  $H_a=42$  kOe and linewidth around 2000Oe at 38 Ghz. Potential microwave applications are in the fabrication of IC circuits and microwave ferrite devices.

FMR data

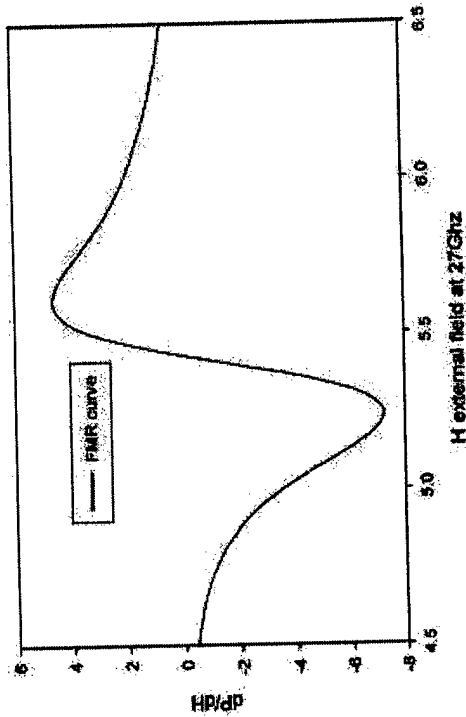


Fig.1

VSM data

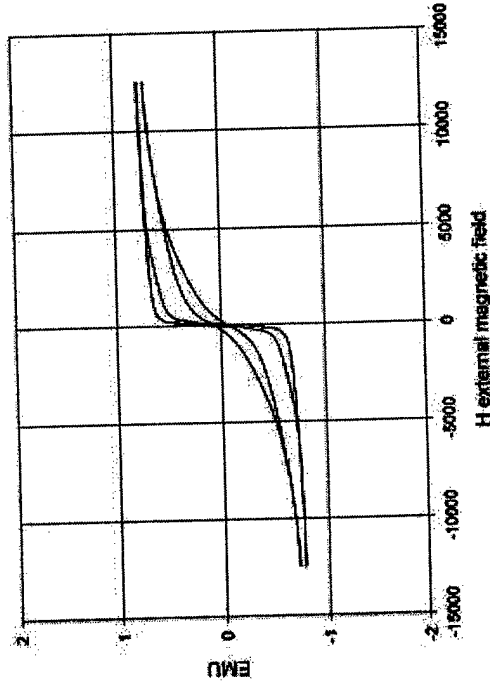


Fig.2