4036407 SCCP/M: MAJOR: CHEMICAL PHYSICS; M.Sc.(CHEMICAL PHYSICS)
KEY WORDS : BARIUM FERRITES SATURATION MAGNETIZATION/ MÖSSBAUER EFFECT/ HYPERFINE FIELD

SIRIKANJANA THONGMEE: SITE PREFERENCE OF IMPURITY IONS IN M-TYPE BARIUM FERRITES. THESIS ADVISORS: PONGTIP WINOTAI, Ph.D., ORAPIN RANGSIMAN, Dr.rer.nat, I MING TANG. Ph.D., 90 p.
ISBN 974-663-014-8

The effect of aluminium substitution into barium ferrites was investigated by saturation magnetization and Mössbauer spectroscopy. Saturation magnetization data and Mössbauer parameters such as hyperfine field, isomer shift, quadrupole splitting, half width and other parameters of samples, site preference of aluminium ions in barium ferrites were observed.

In the first stage of preparation of $BaFe_{12-x}Al_xO_{19}$ (x = 0, 0.1, 0.2, 0.4 and 0.6 respectively) were weighed to stoichiometric compositions. The mixtures were ball-milled for ten hours before they were prefired at 1300 °C in an oxygen atmosphere for two hours using Lenton furnace with heating rate 4 °C/min. The purpose of prefiring is to fabricate the ferrite by solid state reaction. The calcined powders were ball-milled again for seven hours in order to produce particle size of approximately 1 micron. Then the fine calcined powders were pressed into pellets. Several pellets of each composition were sintered at 1300 °C in the air for twenty four hours. During the sintering process, crystallization took place.

After the preparation, crystal structures were investigated by X-ray diffraction (XRD). The site preference of aluminium ions was observed by hysteresisgraph; the saturation magnetization, M_s, was seen to decrease linearly with increasing aluminium substitution. The Mössbauer spectra for the x = 0.1, 0.2, 0.4 and 0.6 specimens were all resolved as superpositions of four sub-spectra (12k, $4f_{iv}$ + 2a, $4f_{vi}$ and 4e). The half width of the Mössbauer lines of $4f_{iv}$ + 2a sextets was seen to broaden as aluminium ions were substituted into the barium hexaferrites. No broadening was seen in the lines of the other sextets (4e, $4f_{vi}$ and 12k).

These behaviors (the line broadening and a linear decrease in saturation magnetization) were consistent with the substitution of Al^{3+} ions preferentially into the 2a sites.