APPENDIX -A

Page No.40 in Chapter Two :

Reijen - gave a quantiative treatment on the role of defects on the sintering rate. He has studied the micrpostructure of the sintering of Spinel Ferrites with an excess of Fe_2O_3 or deficiency of Fe_2O_3. As in the spinel oxygen vacancies in an optimum concentration have to be present to give higher sintering rate. This condition is full filled in spenels that are deficit in Fe_2O_3. Spinels with excess Fe_2O_3 which are s*intered in an aatpmosphere sufficiently exidising to have cation vacancies will have a very low concentration of oxygen vacancies. The sintering rate is then reduced strongly and competing Mechanism such as pore growth can be predominent.

1. P.J.L. Reijen Sci. coram 4 (1968) 169
2. P.J.L. Reijen VI Sym. Reactivity of solids schenactady (Aug. 1968)

Page- No. 68 in chapter Two :

Fig 2.4 mark 'X' indicates observed points on the figure where the spinel structure has been confirmed for particular composition and temperature. '0' are the points on the same figure, that indicate the composition and temperature of final product containing (spinel + Fe_2O_3 + $CuFe_2O_2$). The amount of phases will vary with composition and reaction temperature.

(2...

2) $$\cos(\alpha) = \frac{n_B + 5(1 - x)}{6 + x}$$

where x = composition of Cu ion

n_B = Magnetic moment

α is Y, K angles.

Refer Page No. 137 in Chapter -IV :

Details of calculation of n_B :

Emu/gm of Ni = 53.34 on Oscilloscope

Division of Ni = 14

$$N = \frac{\text{Emu/gm of Ni}}{\text{Division of Ni}} = \frac{53.34}{14} = 3.81$$

$$\sigma_s = \frac{N \times \text{No. of divisions}}{\text{Mass of samples}} \quad \text{(Oscilloscope.)}$$

$$MS = (1-P)\sigma_s \times d_s$$

$$p = \frac{5.1 - d_s}{5.1} \quad \text{where p is porosity.}$$

$$(1-P) = 1 - \frac{5.1 - d_s}{5.1}$$

$$= \frac{d_s}{5.1}$$

$$n_B = \frac{MS \times \text{Molecular weight.}}{5585 \times d_s}$$

$$n_B = \frac{(1-p)\sigma_s \times \text{Molecular weight}}{5585}$$

Page 95, 96, 97 in Chapter - Three :

Ghani explained these breakes on the basis of phase transition. $CuFe_2O_4$ undergoes from tetragonal to cubic phase at this temperature. This temperature will vary respect to the tetragonality ratio.

The condluction mechanism in Cu-Ni ferrite was explained ~~expalined~~ by Ghani et al. He observed three regions or two breaks in conductivity temperature curves. He explain ~~exaplin~~-ed the conduction mechanism in these three regions is as follows :-

1. Region- I. Due to impurities or impurity phases.
2. Region- II. Due to phase transition (For $CuFe_2O_4$ tetragonal to cubic
3. Region-III: Thermally activated hopping conduction.

In Region-II a nd III the conduction mechanism is mainly due to hopping . (i.e. hopping of polaron.) It is also observed that the activation energy is more for polarons than electrons. The observation of high activation energy is attributed to polaron conduction mechanism. Sawant et al have suggested the activation energy $\not< E_1$ 0.2 is due to electron conduction.

(G.K. Joshi , A.Y. Khot, S.R. Sawant)

J.Mat. Sci. (G.B) <u>22</u> (1987) 1694)

The conductivity in $CoFe_2O4$ is mainly due to the formation $Co^{+}3$. The activation energy for first region is minimum and for III Region it is maximum. The changes in activation energies in second region have been found to be sensitive to addition of CO. Applying concept of Elwell and Disxon the results, i.e. activation energy in II to III region is mainly due to thermally activated hopping processes.

(D.Elevell A.Dixon solid State Comm. 6 (1968) 585)

In this case temperature dependence of conductivity is mainly determined by temperature variation in the mobility of cha rge carriers, In such case the charge carriers are strongly localised on Fe^{+2} cations. The localisation may be attributed to electron-phonon interaction (formation of Polarons) or to the strong exchange interaction between carriers and the magnetic sub-lattice (Magenetic polarons). An additional localisation of electrons at Fe^{+2} may arise from the inhomogenity, distributions of ions over octahedral sites (Ref. N. Rezlescs, D. Condurache P.Pertrawiu, E. Luca, J.Am. Ceran Soc. 57 (1974) 40)

The Curie temperatures measured and observed from resistivity plots generally differ. Parker et al have observed similar behaviour and the difference is about 70°C at higher concentrations of Fe in Ni e ferrite system (Ref. S.A.Patil, Ph.D.Thesis, Shivaji University Kolhapur) (P. 164 (1980) .

Page No. 130 in Chapter -IV :

Effect of quenching temperature magnetisation a re studied on these samples. Table 1,2,3, the values of n_B, Tc are given. It is observed n_B and T_c values increase with increase of quenching temperature.Patil [1] have observed similar behaviour in $CuFe_2O_4$ samples. He has attributed this on the basis of transfer of Cu ions from B site to A site and amount of transfer ion increases w-ith increase of quenching temperature.

If Cu Co Ferrite the Similar behaviour may occur, where Cu ions transfer from B site to A site and Fe and Co ion from A to B site. The cation distribution shown in these tables clearly indicates the more and more cu ion is on A site at higher quenching temperature.

The phases like CO_3O_4 and $CuFe_2O_4$ reduce their amount.

(1. S.A. Patil Ph.D.Thesis:
study of physical properties of $Cu_x Fe_{3-x}O_4$ ferrites,
Shivaji university Kolhapur (1980))
