MAGNETIC BEHAVIOR OF DECOMPOSED Mn(II) BAKELITE COMPOSITE

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ABSTRACT: *Manganese (II) Bakelite composite were prepared by incorporating polymer reactants of Bakelite in homogeneous solution of variable salt concentration. After decomposing MMCs at high temperature the magnetic nature in microstructure was analyzed using VSM. The results reported the augmentation of magnetic behavior on increasing decomposing temperature and concentration of metal salt.*

KEYWORDS:VSM, Metal Matrix Composite, Manganese Salt.

1.INTRODUCTION

Metal Matrix Composites (MMC) reinforced with polymers offers an advantage of light weight, high fracture toughness and corrosion resistance[1].Several kinds of polymeric materials such as, epoxy resin, polypropylene, vinyl ethyl acetate, polyamide,Bakelite, silicon rubber is usedfor producing low cost MMC, bonded magnetsetc. [2].These compositesexhibit magnetisms due to incorporation of metal as matrix.Thermal decomposition of composites in muffle furnace at high temperatures can generate nanotubes microparticles and magneticnanocomposites [3,4] at low cost.

Magnetic materials are of two distinct groups, the hard magnetic and soft magnetic materials. The soft magnetic materialshave capacity to get magnetized and demagnetized with the passage of magnetic field[5].Their magnetic permeability, hysteresis and electric resistivity properties have also been assessed in many studies [6].These soft magnetic materials play dominant role in electrical, electronic, computing, telecommunications industries.

Manganese polymer composite developed are extensively studied for its electrical, optical properties and itscarbonized microstructure also revealed proximity in metal particles with increased decomposition temperature [7,8,9]. The carbonized product of Mn (II) Bakelite composite possesses highly unpaired electrons and its processing is cheap, but its magnetic nature is not yet reported.So, to find its promising role as low priced soft magnetic material in micro-electronic and micro-electrical industries,a studyon magnetic behavior in carbonized Mn(II) Bakelite MMCs is done.

2. EXPERIMENTAL

The preparation of metal matrix composite Mn-Bakelite composite 0.5 % Mn (II)-Bakeliteand 2 % Mn (II)-Bakelite were prepared by stir casting method [9]. A large light pink solid mass of plastic with shine appears which is filtered using funnel and filter paper. The solid mass of MMC's were kept on watch glass and dried in desiccators. On drying they appeared red solid mass which were further decomposed using muffle furnace KLS 03/10 with T max 1000^{o}C. The 0.5% and 2 % Mn (II)-Bakelite composite were decomposed at 750^{o}Cand 950^{o}C respectively for 6 hours[10]. The black carbonized product obtained was

powderedandanalyzed for its magnetic behaviorusing Vibrating sample magnetometer VSM Lakeshore – 7410 SU1510-Japan.

3. RESULTS& DISCUSSION:

The M-H plots of VSM of powdered 0.5%, 2% Mn (II)-Bakelite composite decomposed at 750 ^{o}C&950 ^{o}C for 6 hours are shown in Figure 1, 2,respectively. Comparative accounts of the values obtained from the M-H plots are illustrated in Table 1.

The magnetic behavior of Mn (II)-Bakelite Composite powder has been studied as a function of Mn concentration and decomposition temperature. The isothermal M-H curve of Mn (II)-Bakelite composite demonstrates the characteristic patterns of diamagnetic and ferrimagnetic minerals respectively [10]. The negative slope indicates diamagnetic nature of the Bakelite [11]. A small constricted loop suggest development of ferromagnetic or ferrimagnetic nature in the composite [10]. It appears due to the presence of metal salt concentration in MMC.

It is observed that with increase in metal concentration the saturation magnetization increases from 0.0021 to to 0.0089 emu/g for 0.5 %, 2% Mn (II)-Bakelite composites respectively. further with increase in metal matrix concentration remnant magnetization value increases slightly from 0.0005 to 0.002 emu/g for 0.5 %, 2% Mn (II)-Bakelite composites respectively. It indicates weak ferromagnetic nature in MMC. It may be due to higher decomposition temperature which breaks up polymer backbone [9] and brings the metal matrix particles closer. This materialcan be used in designing converters, pulse transformers, magnetic actuators [6].

Table **1** Comparative account of M-H parameters of the decomposed MMCs

Samples	**Magnetization Saturation (Ms)**	**Magnetization remnant(Mr)**	**Higher Coercivity value (Hc)**
0.5 % Mn (II)-Bakelite Composite	0.0021	0.0005	-68.07
2 % Mn (II)-Bakelite Composite	0.0089	0.002	-306.24

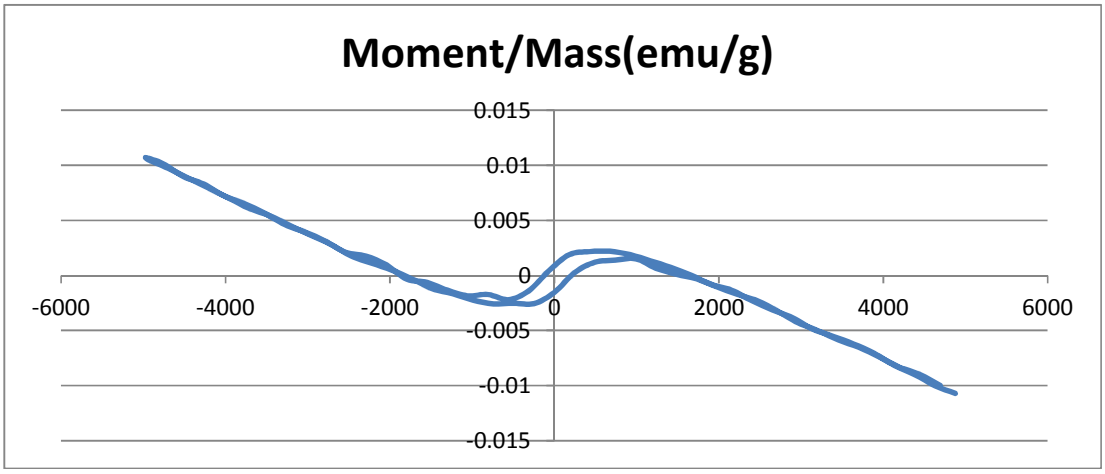

Fig. 1 VSM hysteresis loops for 0.5 % Mn (II)-Bakelite composite decomposed at 750 ^{o}C for 6 hours

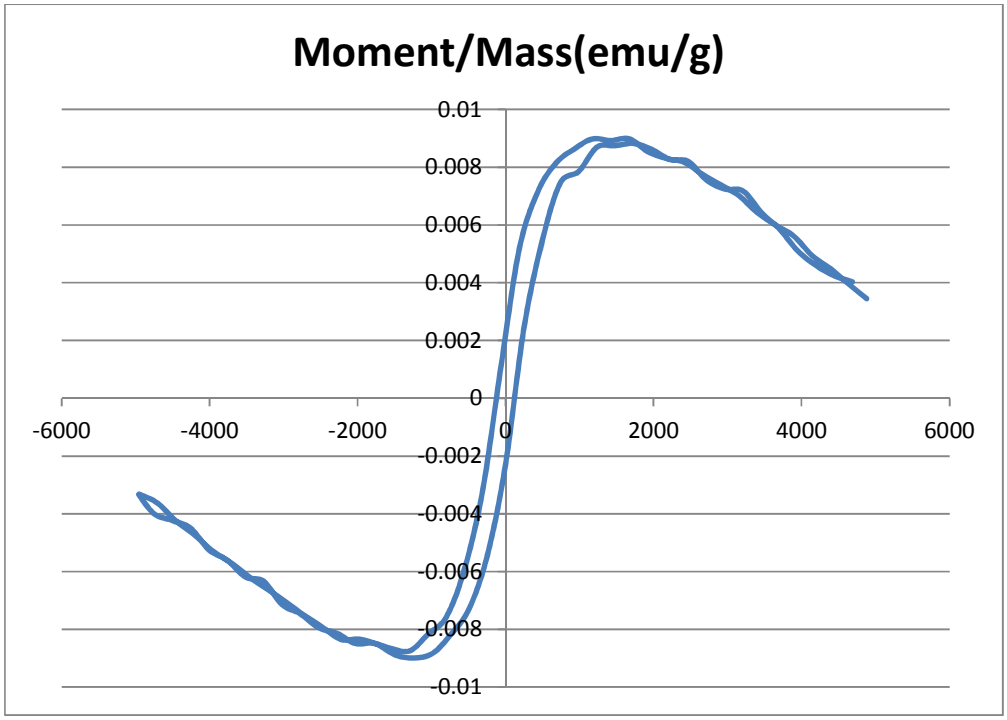

Fig. **2** VSM hysteresis loops for 2 % Mn (II)-Bakelite composite decomposed at 950 ºC for 6 hours

4. CONCLUSION

The VSM technique is effective in studying the magnetic nature of MMC. At higher magnetization field the samples exhibited diamagnetic nature but in lower magnetization field a characteristic weak ferromagnetic hysteresis appears. The M-H curve illustrates the heightening of magnetization on raising decomposition temperature and metal salt concentration.This study indicates its promising role in electronic and electrical devices.

5. ACKNOWLEDGEMENT

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