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## Studies on magnetic behavior of the sample obtained from polymeric precursor technique

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### Abstract

Yttrium barium copper oxide can be prepared by polymeric precursor technique. Sodium polyacrylate has been used as the polymeric part. XRD, SEM and EDS investigations showed, material obtained from polymeric precursor technique contains  $Y_1Ba_2Cu_{2.84}O_{6.58}$ , barium oxide and sodium compound. Material has been kept for magnetic measurements. M-H plot at 77K and 5K are compared and at 5K at very high field, fluctuation of moment in some portions in the plot may be due to fluctuation of field with time which may cause momentary ferromagnetism.

**Keywords:** polymeric precursor, superconductivity, cooper pair, changing magnetic field

### 1. Introduction

Yttrium barium copper oxide (YBCO) superconductor can be prepared by polymeric precursor technique<sup>[1]</sup>. By using sodium polyacrylate, it was possible to prepare a material which was studied by XRD, SEM and EDS and was possible to understand that  $Y_1Ba_2Cu_{2.84}O_{6.58}$ , barium oxide and sodium compound are present in that material<sup>[2]</sup>. Material has been kept for magnetic measurements. M-H plots for the final material at 77K and 5k are compared in this present investigation and they are very much different. Attempt has been made to understand this difference in this present study.

### 2. Material and Method

#### 2.1 Material

Yttrium barium copper oxide can be prepared by polymeric precursor technique using sodium polyacrylate as the polymeric part. Aqueous solution of sodium polyacrylate is mixed with  $Y(NO_3)_3$  solution,  $Ba(NO_3)_2$  solution and  $Cu(NO_3)_2$  solution and pH is raised by adding 60% sodium hydroxide solution. Precipitate obtained is washed, dried and heated to 1000°C for 1 hour in presence of air to remove the polymeric part to get a material which was understood to contain  $Y_1Ba_2Cu_4O_8$ , barium oxide and sodium compound<sup>[3]</sup>. It was washed with water for several times (until washing did not give heavy white precipitate with a solution of potassium pyroantimonate) and then dried. When material was studied by XRD, SEM and EDS, it was possible to understand that it contains  $Y_1Ba_2Cu_{2.84}O_{6.58}$ , barium oxide and sodium compound<sup>[2]</sup> and after several months magnetic measurements for final material are done.

#### 2.2 Magnetic Study

MPMS SQUID VSM (Magnetic Property Measurement system uses Superconducting Quantum Interference Device and vibrating Sample Magnetometer) is used for magnetic measurements. 3.67 milligrams of sample is used for magnetic measurements. In Moment vs Field (M-H) studies, maximum field used was 5 Tesla (1 Tesla  $\Rightarrow$   $10^4$  Oersted) and set temperatures, 77K and 5K are considered in this present study.

### 3. Results and Discussion

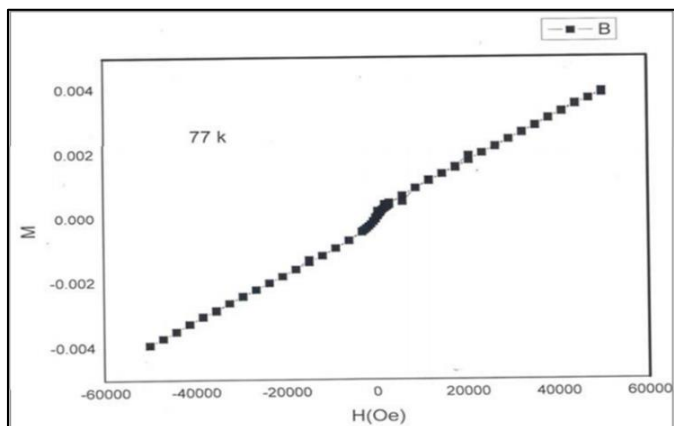
M-H plot for the material for set temperature 77K is shown in fig.1 and M-H plot for the material for set temperature 5K is shown in fig.2. Nature of the plots near about at zero field for 77K and 5K are not same. This is probably due to slight paramagnetic nature for 77K which is almost absent for 5K. At lower temperature (5K), superconducting nature due to cooper pair may be possible which will give diamagnetic behavior. But at 5K, above (+1000) Oersted or almost below (-1000) Oersted, wide fluctuation of moment is evident. This is

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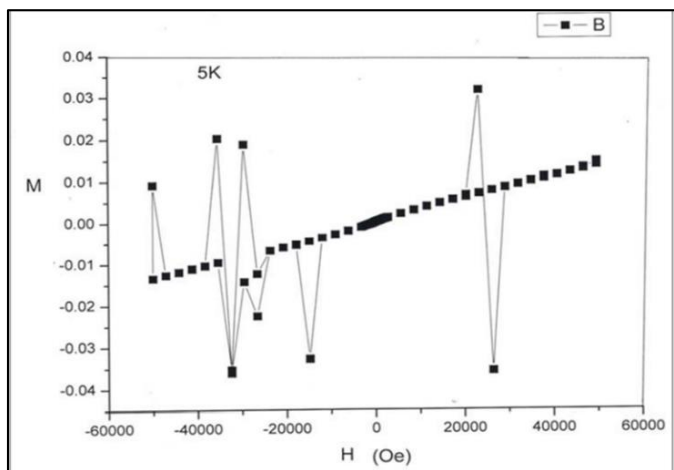
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probably due to sudden change of magnetic field with time which may cause increase in energy of electrons to give momentary ferromagnetism <sup>[4]</sup>. According to Faraday, changing magnetic field in a circuit induces an electromotive force.



**Fig 1:** Moment vs. field plot at set temperature 77K



**Fig 2:** Moment vs. field plot at set temperature 5K

#### 4. Conclusion

M-H plot at 5K is very interesting due to wide fluctuation of moment at same portions of the plot <sup>[5]</sup>. A probable justification of this abnormal behavior of the material is cited here considering Faraday's law and Poole-Frenkel effect. From earlier report, it was possible to understand that magnetic behavior for  $Y_1Ba_2Cu_{2.84}O_{6.58}$  can change for keeping the material for several months probably due to slight change in composition of YBCO.

#### 5. Acknowledgement

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#### 6. References

1. Lee HK, Kim D. J. Appl. Phys. 1989; 65(6):2563
2. Chattopadhyay A. J. Indian Chem. Soc. 2013; 90:1353.
3. Chattopadhyay A. J. Indian Chem. Soc. 2012; 89:1647.
4. Frankel J. Phys. Rev. 1938; 65:647
5. Chattopadhyay A. Int. J. Chem. Studies 2014; 1(6):21.