

# The Fluctuating Superconducting Transitions in Granitoids Rock BPY-1 Crystals

Pawan Kumar<sup>1,\*</sup> and Vaibhav Jain<sup>2</sup>

<sup>1,\*</sup>Associate Prof., Department of Physics, A.S. (P.G.) College, Sikanderabad, U.P., India.

<sup>2</sup>Associate Prof., Department of Physics, DAV (P.G.) College, Bulandshahr, U.P., India.

*The temperature dependent conductivity had been recorded in georock crystal BPY-1 alongwith RF stimulated Hall effects. The surprising features of the study had been discussed.*

**Keywords:** Conductivity, RF stimulated Hall effect.

## 1. INTRODUCTION

The electrical, electronic and magneto conduction in geo matters reveal their tremendous resource potentials. The first class of these crystals is Li-R complexes, where R = benzene, naphthalene, pyrene or graphite [1,2]. The second class includes a large number of complexes involving transition metal atoms instead of Li. A known class of porous coordination polymer (PCP) of formula  $[Cu (BPY-1)_2(SiF_6)]$  does not exhibit particularly high uptake under the same condition for  $CH_4$ ,  $N_2$  and  $H_2O$  presumably because of its lack of open metal sites [3,4].

## 2. EXPERIMENTAL ANALYSIS

The Geo crystals BPY-1 were prepared by cutting the minerals using standard methods and were employed in 4-probe Hall geometry and air drying silver paste was used for making electrical contacts on the samples. The ohmic magneto potential records; transverse & longitudinal currents and temperature dependent DC conductivity have been recorded using NPL superconductivity Lab facility. The sample temperature was monitored with an accuracy of  $\pm 0.1K$  using a standard 100 Ohm platinum sensor in conjunction with the Keithley 224 programmable constant current source and Keithley 181 nanovoltmeter [5,6].

## 3. RESULTS, DISCUSSION & CONCLUSION

The transverse magnetic fields under radio frequency excitations in Geo-Rock crystals reveal a dynamic Hall effect possessing induced oscillatory instabilities in the shape of ohmic and magnetopotential records as shown in Figure 1. The oscillatory magnetopotential rises linearly whereas the ohmic oscillatory variation shows sharp peak at  $f = 5.5MHz$ .

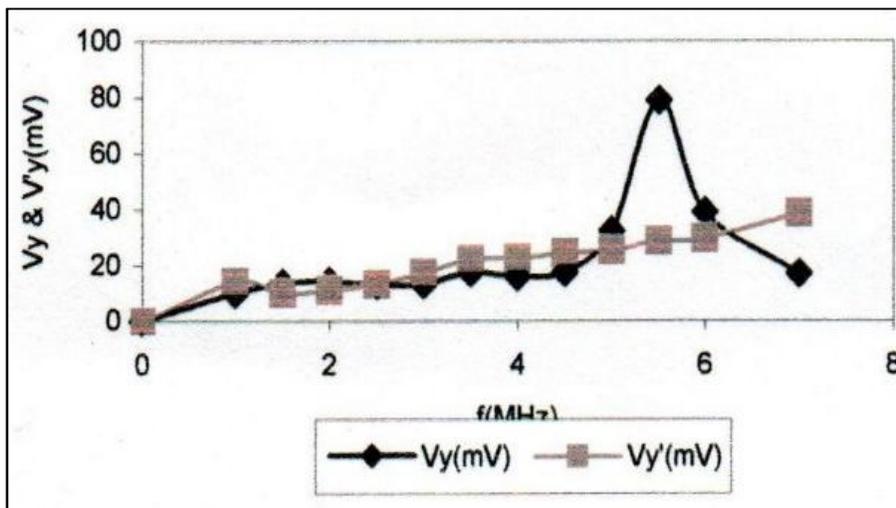


Fig. 1: The MRF stimulated & magnetopotentials in Rock Crystal BPY – 1.

The longitudinal  $i_x$  and transverse  $i_y$  current (mA range) under MRF excitations has been presented in Figure 2 revealing oscillatory variation in both.

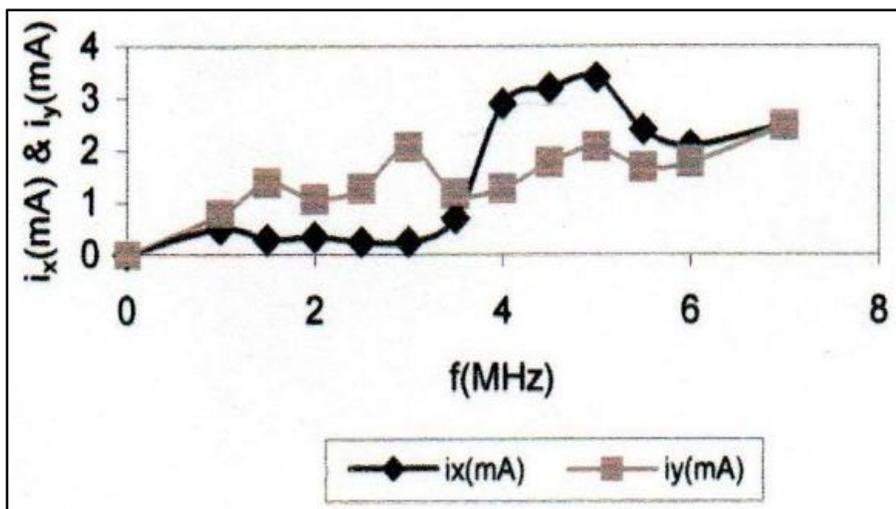


Fig. 2: The MRF stimulated longitudinal & transverse currents in Rock Crystal BPY – 1.

The temperature dependent DC conductivity has been recorded using NPL superconductivity lab facility as shown in Figure 3 depicting fluctuating superconducting trends in low to room temperature range with exciting superconductivity feature neighbouring  $T_c = 300K$ . The RF-attachment with temperature dependent conductivity at

low temperatures is in process with an expectation to switch on the superconductivity transition  $T_c$  towards room temperature side in Rocks & HTS.

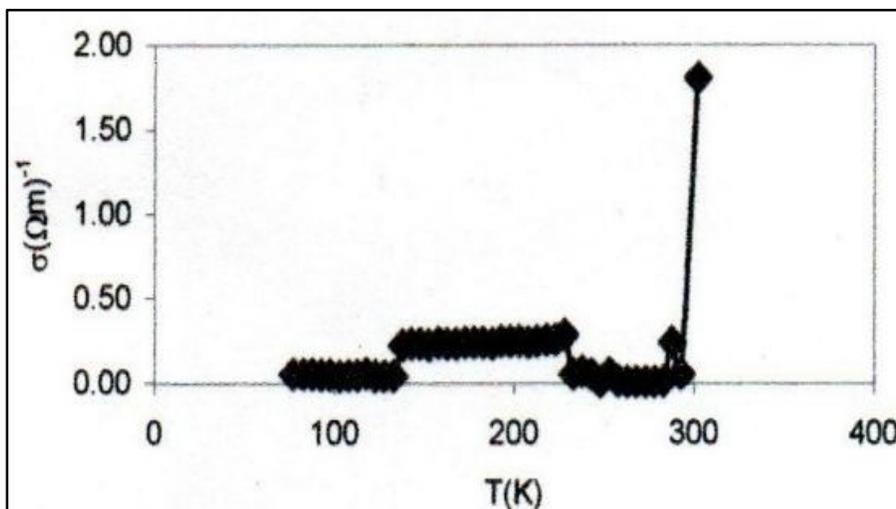


Fig. 3: The temperature dependent electrical conductivity of Rock Crystal BPY – 1.

#### REFERENCES

- [1] A. Pramanik and Hong Seok Kang; "Electronic and Magnetic Properties of Metal-(4,4'-bipyridine) Sandwich Complexes and Their Nanowires", J. Phys. Chem..A, Vol. 115(2), pp. 219-224, 2011.
- [2] S.D. Burd, S. Ma, J.A. Perman, B.J. Sikora, R.Q. Snurr, P.K. Thallapally, J. T, L. Wojtas and M.J. Zaworotko; "Highly Selective Carbon Dioxide Uptake by [Cu(bpy-*n*)<sub>2</sub>(SiF<sub>6</sub>)] (bpy-1 = 4,4'-Bipyridine; bpy-2 = 1,2-Bis(4-pyridyl)ethene)", J. Am. Chem. Soc., Vol. 134(8), pp. 3663-3666, 2012.
- [3] K.S. Mishra; "Arterial system of Lava Tubes and Channels within Deccan volcanics of western India", J. Geo. Soc. India, Vol. 59, pp. 115-124, 2002.
- [4] S.Y. Waghmare; "Correlation of Satpura Electrical Conductivity Anomaly with the Jabalpur Earthquake of May 22, 1997", J. Geo. Soc. India, Vol. 62, pp. 74-82, 2003.
- [5] R. Swarup, Pawan Kumar and Dharvendra Singh; "The RF stimulated Magneto-conductivity in HTS", Proc. Of 44<sup>th</sup> DAE Solid state Physics Symp. (DAE – SSPS 2001), 103, 11 BARC, Mumbai Dec. 26-30, 2001.
- [6] R. Swarup, Pawan Kumar and S.K. Agarwal; "The Magneto-Resistivity Anisotropy in HTS (Bi<sub>2212</sub> and Y<sub>123</sub>)", Proc. of 46<sup>th</sup> DAE solid state Physics Symp. (DAE-SSPS 2003/8), Jiwaj Univ. Gwalior, Dec. 26-30, 2003.