International Journal of Scientific Research in Science and Technology
Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)
© 2021 | IJSRST | Volume 8 - Issue 1

Synthesis and Characteristics of Cuo Doped Polyaniline Nano Composites

A. V. Rajgure[1], D.R. Bijwe*[1], P. S. Deole, S .S. Kawar[2], S. P. Ganorkar[1], A. R. Bhojane[1], N. B. Nimkar[1], R. K. Kitukale[1], P. A. Pethe[1], P. S. Pathare[1]

[1]Department of Physics, G. S. Tompe Arts, Commerce & Science College, Chandur Bazar, Dist.- Amravati, Maharashtra, India

[2]Department of Physics, Dr. R.G. Rathod Arts and Science College, Murtizapur, Dist.- Akola, Maharashtra, India

ABSTRACT

In this present paper, Nano crystalline and bulk CuO are prepared by thermal decomposition of freshly prepared $Cu(OH)_2$. The PAni-CuO samples are prepared with 10 and 35 wt%. The structural changes of prepared composite materials were carried out by X-ray diffraction (XRD) tool.

Keywords : PANI, CuO, XRD

I. INTRODUCTION

Rapid development of industrialization need to stable, low cost ecofriendly effective battery. Day to Day Advance in technology leads to the need of energy storage systems of eco-friendly nature with fast charging and discharging time[1-3]. Nanotechnology is wide progressing to produce growing media with public interest since from the past decade which has broad application in many research areas, development and industrial application.The electrical conductivity of the PAni can be modified by the process of doping with suitable metal oxide. The CuO nanoparticles are the primary dopants which vary the structural, magnetic, optical and/or electronic properties of the PAni and it is accompanied by large increase in conductivity[4-5].Nano particles of copper oxide exhibit the nature of a semiconductor with a band gap of 1.5 to 1.8 eV with their application in photo detectors, solar cells, gas sensors, biosensors, super capacitors, removal of organic, magnetic storage media etc8.

In this research work, Copper oxide nanoparticles were prepared by eco friendly low temperature solution Co-pracipated synthesis and the polyaniline- CuO Nano Composites of doping concentrations (10, 35wt%) were synthesized . The samples were characterized by XRD, studies and specific surface area.

II. EXPERIMENTAL

2.1. Synthesis of Polyaniline (PAni):

The analytical grade 0.2M aniline hydrochlorideand 0.25 M ammonium peroxydisulfate were used as precursors. Aniline hydrochloridewas dissolved in distilled water to form a transparentsolution; ammonium peroxydisulfate was added drop-wise to the solution under continuous stirring until pH becomes around 8. The precipitate obtained was washed with distilled water for several times to remove chlorine

ions. It was further it was dried at 60˚C for 2 h in air to obtain fine Nano crystalline powder.

2.2. Synthesis of CuO Nano Composite

Nano crystalline and bulk CuO are prepared by thermal decomposition of freshly prepared $Cu(OH)_2$ at different temperatures. The Cu $(OH)_2$ is prepared by reacting aqueous solution of 0.1M copper nitrate,$Cu(NO_3)_2$. $3H_2O$ and 0.5M sodium hydroxide. The NaOH solution is added drop wise with constant stirring until the PH of the system reaches to 12. The chemical reaction between copper nitrate and sodium hydroxide solution is as follows

$$Cu(NO_3)_2 + 2NaOH \longrightarrow Cu(OH)_2 + 2NaNO_3$$

The resulting blue-green gel is washed several times with distilled water until free nitrate ions. Finally the gel is dried by heating at 100^{o}C for 10 h. Copper hydroxide decomposes into nano crystalline copper oxide on heating as follows

$$Cu(OH)_2 \longrightarrow CuO + H_2O$$

III. RESULTS AND DISCUSSION

3.1. XRD analysis

The X-ray Diffraction Study was carried out using X-ray diffractro meter in the 2Θ range from 10˚ to 80˚. X-ray diffraction (XRD) method is used for materials characterization as it provides important information about the internal structure of matter such as crystallite size and crystal structure. All patterns exhibit peaks corresponding to the rutile structure of polycrystalline CuO with the maximum intensity peak corresponding to (110) plane [6]. It was observed that the relative intensities of all the peaks reduce with an increase in PAni Content. It was also observed that the peak broadening takes place with the increasing PAni content which is in good agreement with the earlier studies [7-9]. The increase in FWHM along with the reduction in peak intensity suggests that PAni incorporation into CuO lattice results in lowering of crystallite size of CuO. The Pure PAni shows larger voids Fig. 3(a) as compared to doped samples which have smaller uniformly distributed voids in Fig. 3(b and c).

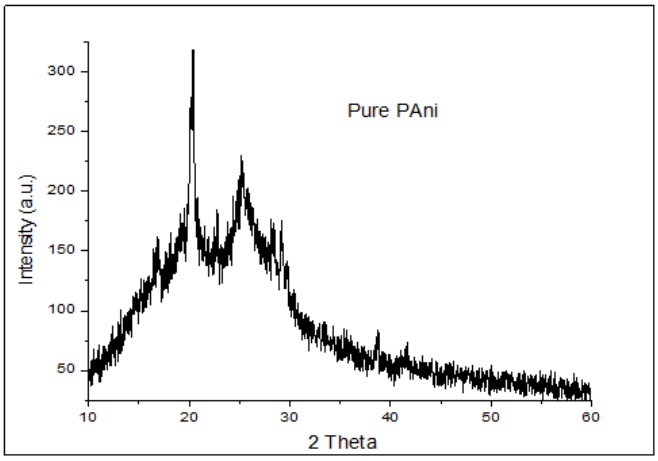

Fig. 1(a) XRD of Pure Polyaniline (PAni)

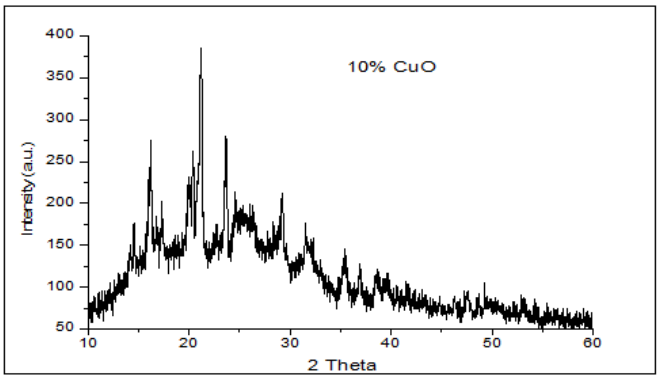

Fig.1(b)XRD of 10wt%CuO-PAni Nano Composite

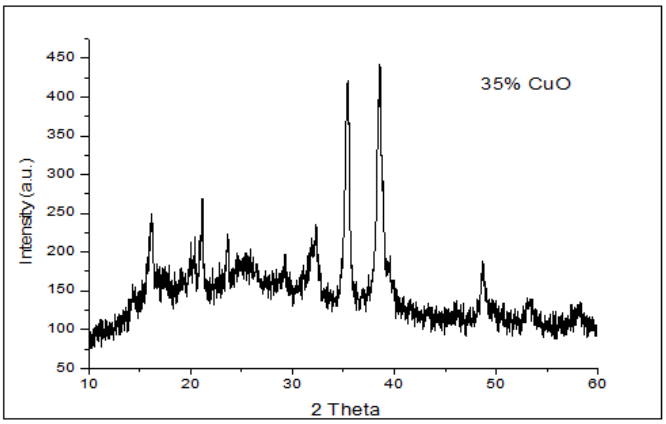

Fig.1(c) XRD of 35wt%CuO-PAni Nano Composite

IV. CONCLUSION

The study of the pure PAni and (10 &35wt%) PAni doped CuO polyaniline increases due to addition of PAni wt %. The 35wt% PAni nano omposite plays the important role in the contribution Surface modification.

V. REFERENCES

[1]. Sexena, V, Malhotra, B D, Curr. Appl. Phys., 3, 293-305 (2003)
[2]. M. Chang, H. Liu and C.Y. Tai (2011) Powder Technology 207, 378–386.
[3]. Chaudhari, S, Mandate, AB, Patil, KR, Sainkar, SR, Patil, PP, J. Appl. Polym. Sci., 106,220-229 (2007)
[4]. Gupta K, Jana P C, Meikap A K., Synthetic Metals 160 (2010) 1566-1573.
[5]. Mathai C J, Saravanan S, Anantharaman M R,Venkitachalam S, Jayalekshmi S., J. Phys. D: Appl. Phys., 35 (2002) 240
[6]. Amnerkar R H, Adgaonkar C S, Yawale S S, Yawale S P., Bull. Mater. Sci. 25 (2002) 431-434
[7]. Lanje, A.S., Sharma, S.J., Pode, R.B., Ningthoujam, R.S., Advances in Applied Science Research, 1 (2) 36-40, (2010)
[8]. A. B. Kaiser, C. K. Subramanium, P. W. Gilberd and B. Wessling, Synth. Met., 69, 197 (1995).
[9]. Mittal, H., Kaith B., Jindal R, Advances in Applied Science Research, 1 (3) 56-66, (2010)