TECHNICAL RESEARCH ORGANISATION INDIA TROI

# MOSSBAUER, XRD AND THERMALLY INDUCED STRUCTURAL STUDIES ON POLYANILINE NANOCOMPOSITE MATERIAL CONTAINING DIFFERENT CONCENTRATION OF MAGNETITE NANOPARTICLE

A.K. Barve[1], S.M. Gadegone[1*], M. R. Lanjewar[2] and R.B. Lanjewar[2*].
[1*] Kamla Nehru Mahavidyalaya, Sakkardara, Nagpur 440009.
[2] Department of Chemistry, R.T.M. Nagpur University, Nagpur-440012
[2*] Dharampeth M.P. Deo Memorial Science College, Nagpur 440033.
*E-mail:* rb_lanjewar@rediffmail.com

Abstract

**The Mössbauer Spectroscopy of magnetitenanoparticles embedded in a polymeric matrix of PANI was studied because it allows agood dispersion of nanoparticles in the polymeric matrix.All the concentration of iron salts shows quadrupole splitting and hyperfine splitting. From XRD study it is clear that the intensity of the peaks becomes stronger with increasing the nanoparticle loadings, while the two original peaks of PANI show a same intensity at 2θ = 19.09 and 25.04°. The properties studied by TGA indicate an improvementin thermal stability of PANI by the addition of different concentration of metal oxide.**

## Introduction:

IONPs are found naturally in the environment as particulate matter in air pollution and in volcanic eruptions. Either $Fe_3O_4$ (magnetite) or $\gamma$-$Fe_2O_3$ (maghemite), particles can be generated as emission from traffic, industry and power stations but can also be specifically synthesized chemically for a wide variety of applications. The mechanism for the incorporation of metal oxide into the polymer involves three steps:

i. Before the reduction of metal nanoparticles, metal ions coordinate to thefunctional group of the polymers and form complexes.
ii. During the formation of zero valence metals (reduction) or metal oxides(oxidation), the particles coordinate weakly to the polymersafter the formation of the respective colloids, polymers act as stabilizers.
iii. The hydrophilic ends are adsorbed on the surface of the particles while thehydrophobic ends formed a barrier surrounding the metal particles toprotect it.

The magnetite nanoparticles possess high surface area to volume ratio, induced dipole interaction and Vander Waal's attractive forces which cause the particles to aggregate[1]. To overcome these limitations, it is important to shield the $Fe_3O_4$ nanoparticles by coating them with macrocyclic surfactant, polymers and inorganic metals[2].

Mössbauer Spectroscopy is known to be powerful, non-destructive techniquefor the determination of $Fe^{2+}$ and $Fe^{3+}$ ratios in nanoparticles as well as in polymer matrix. Mössbauer Spectroscopic study has been carried out at room temperature in order to get the information of hyperfine parameters of the magnetite nanoparticles. The peak position in a Mössbauer spectrum is sensitive to extra nuclear environment such that different compounds give different spectra attributable to hyperfine interaction, the interaction between the nuclear charge distribution and extra nuclear electric and magnetic fields. These hyperfine interactions give rise isomer shift (δ), quadrupole splitting ($\Delta E_Q$) and magnetic Zeeman splitting ($H_{eff}$). From chemist's point of view, these three parameters are the most widely used in the study of structure and bonding characteristics of compounds.

ISSN (PRINT): 2393-8374, (ONLINE): 2394-0697, VOLUME-6, ISSUE-1, 2019