***Eco-friendly synthesis of Zr nanoparticles by seed coat of E.officinalis their characterization and applications***

**Pragya Goyal1. Arpan Bhardwaj1. Bhupendra Kumar Mehta2. Darshana Mehta2**

Pragya Goyal, pragyagoyalujn@gmail.com; Arpan Bhardwaj, arpanbhardwaj11@gmail.com |1Govt. Madhav Science PG, College, Ujjain, M.P. 456010, India.Bhupendra Kumar Mehta, bkmehta11@yahoo.com; Darshana Mehta, drdarshana31@gmail.com|2 School of Studies in Chemistry and Biochemistry, Vikram University, Ujjain, MP 456010, India**.**

**Abstract**

*E. officinalis* is also called *Phyllanthus emblica*, whose eatable organic products are broadly utilized in Indian Ayurvedic medication as well as non eatable also (Dharmananda *et al*., 2003). The ethanolic seed coat extract of plant were successfully synthesized by green synthesis. The primary characterization X- ray diffraction was confirmed the tetragonal crystal structure by JCPDS NO. **80-2155** and exists with 54.08 nm in size. There transition from the valence band to the conduction band from oxide species to zirconium cation (O-→Zr4+) was showed absorption at wavelength 325 nm in UV –Vis spectroscopy. The distinct peaks were observed at 3302, 2925.74, 2296.72, 2160, 2072, 2009, 1745.26, 1623.25, 1457.61, 1155.11, 504.09 cm-1. The stability of nanoparticles and average particle size were measured by zeta potential and DLS via the value of -12.96 and **286.5** nm respectively. These dispersed images were scaled by ImageJ software for the conformation of the average diameter of nanoparticles scaled of 1µm, was obtained 14.65 nm and their mean particle size by TEM was scaled of 0.2 µm, 5.1µm, and 100µm. The mean size (70 nm) was increased due to hydrodynamic overview of particles. The antimicrobial activity of nanoparticles was useful for various *in vitro* studies by many pathogenic strains.

**References**

Ankamwar, B., Damle, C., Ahmad, A. and Shastry, M. **(2005).** Biosynthesis of gold and silver nanoparticles using *Emblica officinalis* fruit extract, their phase transfer and trans-metallation in an organic solution. *Journal of Nanoscience and Nanotechnology*, *5*(10), 1665-1671.

Bansal, V., Rautaray, D., Ahmad, A. and Sastry, M. **(2004)** Biosynthesis of zirconia nanoparticles using the fungus *Fusarium oxysporum*. *Journal of Materials Chemistry*, *14*(22), 3303-3305.

Davar, F. and Loghman-Estarki, M. R. **(2014)**. Synthesis and optical properties of pure monoclinic zirconia nanosheets by a new precursor. *Ceramics International*, *40*(6), 8427-8433.

Garvie, R. C. **(1978)**. Stabilization of the tetragonal structure in zirconia microcrystals. *The Journal of Physical Chemistry*, *82*(2), 218-224.

Gole, J. L., Prokes, S. M., Stout, J. D., Glembocki, O. J. and Yang, R. **(2006)**. Unique properties of selectively formed zirconia nanostructures. *Advanced Materials*, *18*(5), 664-667.

Gowri, S., Gandhi, R. R. and Sundrarajan, M. **(2014)**. Structural, optical, antibacterial and antifungal properties of zirconia nanoparticles by biobased protocol. *Journal of Materials Science and Technology*, *30*(8), 782-790.

1. P. Goyal, A. Bhardwaj, B. Mehta, D.Mehta. Research article green synthesis of zirconium oxide nanoparticles (ZrO2NPs) using Helianthus annuus seed and their antimicrobial effects, J. Indian Chem. Soc. 98(8) (2021), 100089.<https://doi.org/10.1016/j.jics.2021.100089>.