CHAPTER - IX

Conclusion

Selection of the green synthesis route followed by the selection of different metal oxide for imparting antibacterial activities.

Chapter IV to VII deals with the synthesis of MgO nanoparticles by greener method. The particle size of synthesized MgO nanoparticle powders measured by PSA was approximately 80-300 nm. SEM and EDX images confirmed the adsorption of MgO nanoparticles on the cotton fabric. The fabric strongly increases adsorption of MgO nanoparticles on the surface of the fibres due to the crosslinker (citric acid) and change of surface charge on the cellulose fibres. The MgO nanoparticles treated cotton fabric exhibited stronger antibacterial activity due to the increasing MgO nanoparticle absorption on the surface of cellulosic fibres.

The nanosize of synthesized copper oxide is confirmed by XRD, SEM, AFM and TEM analysis. The average crystallite size for the intense peak measured were 36 nm from XRD analysis. SEM, AFM and TEM techniques illustrate the morphology of rod like shapes with less agglomeration. SEM and EDX images of CuO nanoparticles treated cotton fabric confirmed the adsorption of CuO. The fabric has strong absorption of CuO nanoparticles on the surface of the fibres due to the crosslinker (citric acid) and change of surface charge on the cellulose fibres. The CuO nanoparticles treated cotton fabric exhibited stronger antibacterial activity due to the increasing CuO nanoparticles adsorption on the surface of cellulosic fibres.

The average crystallite size of the ZnO nanoparticle was found to be 50 nm from XRD analysis. SEM and AFM techniques illustrate the morphology of needle like shapes with less agglomeration. SEM and EDX images of ZnO nanoparticle treated cotton fabric confirmed the adsorption of ZnO. The fabric has strong adsorption of ZnO nanoparticles on
the surface of the fibres due to the crosslinker (citric acid) and change of surface charge on
the cellulose fibres. The ZnO nanoparticles treated cotton fabric exhibited stronger
antibacterial activity due to the increasing ZnO nanoparticles absorption on the surface of
cotton fabrics.

The XRD and SEM analysis supports the crystallinity and surface morphology of the
biosynthesized nanoparticles. TEM analysis confirmed the NiO nanoparticles. SEM and EDX
images confirmed the adsorption of NiO nanoparticles on the cotton fabric. The fabric
strongly increases adsorption of NiO nanoparticles on the surface of the fibres due to the
crosslinker (citric acid) and change of surface charge on the cellulose fibres. The NiO
nanoparticles treated cotton fabric exhibited stronger antibacterial activity due to the
increasing NiO nanoparticles absorption on the surface of cellulosic fibres.

In chapter VIII we have discussed the synthesized metal oxide (MgO, CuO, ZnO &
NiO) nanoparticles coated on cotton fabric using sodium alginate as a crosslinker. Treated
cotton fabrics were characterized by SEM with EDX and their antibacterial activity was
analyzed by agar diffusion disc method. Absorption of various metal oxide nanoparticles
treated cotton fabric is higher than normal cotton. SEM and EDX images confirmed the
absorption of various metal oxide nanoparticles on the cotton fabric. The cotton fabric
strongly increases absorption of nanoparticles on the surface of the fibres due to the
crosslinker (sodium alginate) and change of surface charge on the cellulose fibres. This type
of metal oxide nanoparticles treated fabric may be used in biomedical fields such as wound
healing, surgical masks and so many applications because of their good antibacterial activity.

**Future area of work**

Biosynthesis of metal oxide nanoparticles can be extended to many unexploited metal
oxide nanoparticles by using versatile plant materials. Application of biosynthesized metal
oxide nanoparticles on textiles for UV-protection, self-cleaning and many others. Though certain natural antibacterial agents are available at present, only few studies have been explored for their antibacterial activity on textile materials and also require progressive and consolidated data on antimicrobial finished product of textiles particularly in the preparation of medical cloths.