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Synthesis of polyurethane silver nanocomposite for health care devices

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New instrumentation for medical healthcare devices is the need of today for more proper diagnosis and curing of deadly diseases. Therefore, these instruments have to be biocompatible. Since for long back, polyurethane for their flexible properties from rigidity to elasticity is used in device fabrication and also now a days it has been explored for its biocompatibility, hence we had synthesized biocompatible polyurethane silver nanoparticle composite in a novel way in which prepolymer is synthesized purely by green method. Silver Nanoparticles was synthesized by reducing silver nitrate using table sugar (sucrose) in polyethylene glycol (PEG400). As all the reagents used are biodegradable, the process is purely green synthesis. These prepolymer were characterized for the nanoparticle size by Surface Plasmon Resonance (SPR) at 426 nm (Figure 1) and Surface Electron Microscopy (SEM) images in the range 6 to 12 nm (Figure 2).

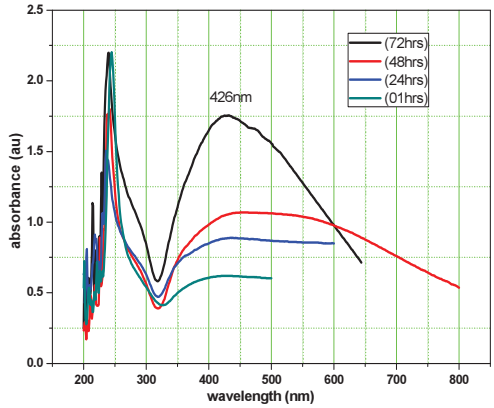

Figure 1: UV spectrum of PEG-AgNP

In the next step these synthesized prepolymer polyol containing silver nanoparticles (PEG-AgNP) was reacted with polyisocyanate desmodour L75 in 1:1 equivalent ratio of NCO **:** OH (NCO content of polyisocyanate to OH content of polyol) to form polyurethane silver nanocomposite [1]. The nanocomposite thus formed was characterized by FTIR, SEM, XPS and Contact Angle measurement.

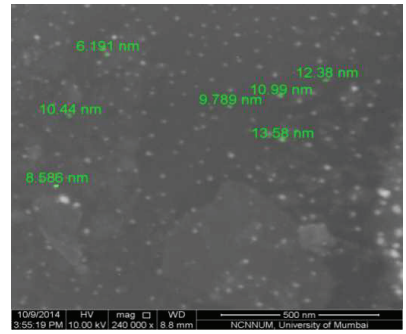

Figure 2: SEM image of PEG-AgNP

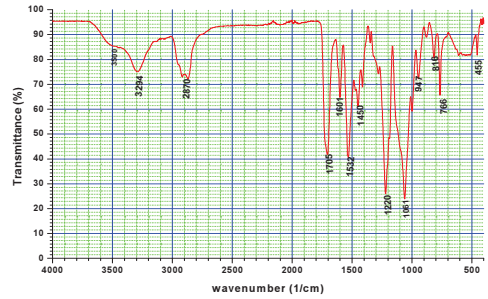

Figure 3: ATR-FTIR of PU-AgNP composite

ATR-FTIR spectrum (Figure 3) confirmed the completion of the reaction as the NCO peak at 2260 showed nil absorbance. SEM analysis gave the confirmation of silver nanoparticles embed in polymer matrix with its morphology. XPS confirmed all the silver ions got reduced to silver nanoparticles. Its antibacterial study showed its antibacterial activity [2] and nanoindentation [3] showed its elasticity and hardness property for device fabrication of medical instruments.

References

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