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Preparation of silver nanoparticles using tryptophan and its formation mechanism

Zoya Zaheer^b, Maqsood Ahmad Malik^a, F.M. Al-Nowaiser^b, Zaheer Khan^{a,b,*}

^a Department of Chemistry, Jamia Millia Islamia (Central University), Jamia Nagar, Okhla, New Delhi 110025, India

^b Department of Chemistry, Faculty of Science, King Abdul Aziz University, PO Box 80203, Jeddah 21413, Saudi Arabia

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ABSTRACT

A non-toxic route was used for the preparation of silver nanoparticles using tryptophan (Trp) as reducing/stabilizing agent in the presence of cetyltrimethyl ammonium bromide (CTAB). Role of water soluble neutral polymer poly(vinylpyrrolidone) (PVP) has been studied on the growth of yellow colour silver nanoparticle formation. The synthesized nanostructures were characterized by UV-Visible absorption spectroscopy, transmission electron microscopy (TEM) by observing the size and distribution of silver nanoparticles. As the reaction proceeded, particles grew up to about 10 and 20 nm in the presence and absence of PVP, respectively, as determined by TEM. The formed nanoparticles showed the highest absorption plasmon band at 425 nm. Rate of silver sol formation increases with the [Trp], [CTAB] and [PVP], reaching a limiting value and then decreases with the increase in concentrations of these reagents. It was observed that nanoparticles are spherical, aggregated and poly dispersed in the absence and presence of PVP, respectively. On the basis of kinetic data, a suitable mechanism is proposed and discussed for the silver sol formation.