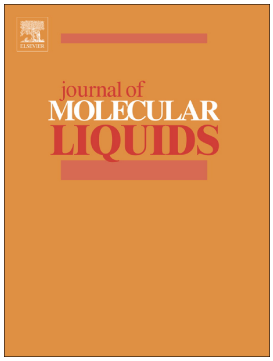

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Shradhey Gupta, Vikas Kumar, Khashti Ballabh Joshi

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Solvent Mediated Photo-induced Morphological Transformation of AgNPs-Peptide Hybrids in Water-EtOH Binary Solvent Mixture

Shradhey Gupta,[#] Vikas Kumar [#] and Khashti Ballabh Joshi*

School of Chemical Science and Technology,
Department of Chemistry,
Dr. Harisingh Gour Central University, Sagar (MP), 470003, India.
E-mail(s): kbjoshi77@gmail.com; kbjoshi@dhsgsu.ac.in

Abstract

This study demonstrates the role of greener solvents on the formation of photo-induced silver nanoparticles (AgNPs) which were encapsulated by biotinylated ditryptophan peptide molecule during self assembling process, at a particular wavelength which is 280 nm. The intermolecular H-bonding and polarity of binary solvent mixture play together a decisive role in controlling both mechanistic and kinetic pathways to modify the morphology of AgNPs-peptide hybrids. The unprecedented morphological modifications are obtained in the highly polar environment. Such modifications directly impact on the kinetics of AgNPs formation where the rate of AgNPs formation is adequately behaved bi-exponential; however, the fate of this kinetic nature is changed in the low polar solvent where the rate pursued only exponential nature. Consequently, the rate of AgNPs formation was found slowest in 80% water in ethanol compared to other solvent compositions. Therefore, the polar environment of mixed solvent leads remarkable modification in the AgNPs morphology, which could help to explain the solvent guided AgNPs modification under light. In addition to this, first time we explored the possible application of this biotinylated peptide is to detect Ag^+ ions (~50 µM) affected proteins/biomolecules where we noticed the changes in Ag^+ affected avidin sample, thus, can potentially be used as a silver ion sensor up to ~50 µM.

Keywords: Solvation, Greener solvent, Nanomaterials, AgNPs, and Peptide sensor

1.0 Introduction

A clean synthetic preparation (i.e. greener approach) of metallic nanoparticles (MNPs) is receiving significant attention in the field of nanotechnology, particularly for nano-scale-products which exhibit unusual or unexpected properties that can be used for a wide range of