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Investigation on the mutual interactions between xanthan gum and a slab of inorganic nanoparticles

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Abstract

The challenge in using nickel oxide and other metal nano oxides is the lack of solubility and the preparation of solutions with sufficient concentration in these areas. In this work, we managed to stabilize this nanoparticle in the aqueous environment. This was done by using natural and biocompatible xanthan polymer. No significant change in the rheological properties of the stabilized nanooxide immediately after production and after a period of one month shows that our stabilization method was successful. In order to better understand the adsorption mechanism of the stabilizer (xanthan) at the nanoparticle level, a theoretical study was conducted based on quantum calculations and it was determined that surface adsorption occurred. Our additional studies have been the use of this stabilized nanooxide in the liquid phase in interaction with Human Serum Albumin protein. It seems that the interaction has more kinetic stability than thermodynamic stability. The experimental study based on fluorescence spectra shows that the interaction between nanoparticle and protein is hydrogen bonding and van der Waals interactions. We developed complementary ab initio docking studies to gain a better understanding of the interaction mechanism. The theoretical results in fluorescence confirmation show that nanoparticle interactions take place through hydrogen bonding. In addition to that, studies on the theory of electrostatic interaction also exist.

Keywords: inorganic nanoparticles, xanthan gum, rheological properties, fluorescence, human serum albumin