Nickel selenide (NiSe) quantum dots (QDs) were successfully synthesized using a simple microwave process from the low-cost precursors such as nickel chloride, sodium selenite, hydrazine (reducing agent) and starch (capping agent). The synthesized NiSe QDs were characterized using UV–vis spectroscopy, X-ray diffraction (XRD), high resolution transmission electron microscopy (HRTEM), and Energy-dispersive X-ray spectroscopy (EDS). The results obtained from HRTEM and EDS revealed the formation of starch capped NiSe QDs of size less than 5 nm. Their in-vitro binding behavior with human serum albumin (HSA) was investigated using steady-state fluorescence, time-resolved fluorescence and synchronous fluorescence spectroscopic techniques under physiological conditions. The steady-state fluorescence spectral results showed that NiSe QDs quenched the fluorescence of HSA along with the blue shift which revealed the increase in the hydrophobicity of the microenvironment surrounding the fluorophore site. The calculated free energy change (ΔG°) suggested the spontaneity of the NiSe QDs binding with HSA. Time-resolved fluorescence spectra of HSA with NiSe QDs confirmed the quenching mechanism as static. Synchronous fluorescence spectral results showed that the fluorophore site is near to the tryptophan moiety (Trp-214). These results will shed light towards the understanding of the NiSe QDs pharmacokinetics.

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