Removal and preconcentration of bortezomib drug aqueous samples using magnetic multiwall carbon nanotubes

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In this study magnetic nanoparticles was synthesized on the surface of multiwall carbon nanotubes and in this firat of study, the product was used as a powerful adsorbent for the remove of bortezomib aqueous solutions. In the second section of this study preconcentration of bortezomib was performed for determination of trace amounts of bortezomib. For this purpose, Fe3O4 magnetic nanoparticles were chemically precipitated on the surface of carbon nanotubes. Structure, magnetic properties and morphology of the prepared nanoadsorbent was studied using FT-IR,VSM and XRD. The factors affecting the bortezomib removal including solution pH, ionic strength, sorbent mass and contact time was investigated using Taguchi experimental design method. The concentration of non-absorbed Bortezomib was determined using high performance liquid chromatography. In order to study Kinetic and absorption isotherms, four kinetic models (pseudo first order, pseudo second order, Inter-particle and Elovich) were studied in optimum reaction condition. Results showed that the optimum reaction condition for removal of Bortezomib is at concentration of 25mg L-1 (50ml), pH=5, Ionic Strength of 0.05 M, 0.08 g amount of absorbent and reaction time of 45 min. The calibration curve was linear in the range of 1 to 100mg.L-1 with correction coefficient of 0.9988. Absorption model was in accordance to Langmuir isotherm (R2=0.958) and psedu-second order kinetic model (R2=1). Also, absorption of Bortezomib with synthesized nano-absorbent real water samples was investigated and satisfactory results were obtained. Then, desorption and preconcentration of bortezomib was investigated using high performance liquid chromatography. One ml of methanol was determined as appropriate solvent for optimum desorption of bortezomib prepared nano-absorbent. The nano-absorbent was recovered up to 7 times. The limit of quantification and qualification of

Bortezomib in the concentration of 25-1000 µg L-1 was 10.1 and 33.8, respectively. The absorption of Bortezomib a waste sample containing 500µg L-1 of Bortezomib was studied 3 times with relative standard deviation of 0.62 which indicates high repeatability of the method.

Keywords : bortezomib, adsorption, removal, magnetite nanoparticle