

**Dual-functional iron oxide nanoparticles coated with polyvinyl alcohol/5-fluorouracil/zinc-aluminium-layered double hydroxide for a simultaneous drug and target delivery system**

ABSTRACT

Iron oxide nanoparticles are suitable for biomedical applications owing to their ability to anchor to various active agents and drugs, unique magnetic properties, nontoxicity, and biocompatibility. In this work, the physico-chemical and magnetic properties, as well as the cytotoxicity, of Fe<sub>3</sub>O<sub>4</sub> nanoparticles coated with a polymeric carrier and loaded with a 5-fluorouracil (5-FU) anti-cancer drug are discussed. The synthesized Fe<sub>3</sub>O<sub>4</sub> nanoparticles were coated with polyvinyl alcohol and Zn/Al-layered double hydroxide as the drug host. The XRD, DTA/TG, and FTIR analyzes confirmed the presence of the coating layer on the surface of nanoparticles. The results showed a decrease in saturation magnetization of bare Fe<sub>3</sub>O<sub>4</sub> nanoparticles after coating with the PVA/5FU/Zn/Al-LDH layer. In addition, the presence of the coating prevented the agglomeration of nanoparticles. Furthermore, the pseudo-second-order equation governed the kinetics of drug release. Finally, the coated nanoparticles showed stronger activity against liver cancer cells (HepG2) compared to that of the naked 5-FU drug, and displayed no cytotoxicity towards 3T3 fibroblast cell lines. The results of the present study demonstrate the potential of a nano delivery system for cancer treatment.

**Keyword:** Nanoparticles; Fe<sub>3</sub>O<sub>4</sub> nanoparticles; Layered double hydroxide; Polymeric coating