ABSTRACT

Mesoporous silica nanoparticles are the best drug carrier for controlled and sustained drug delivery. Present work outlines the various applications of MSNs that show the desirable characteristics such as high percentage of drug loading with sustained drug release. Functionalized (MCM-41-Fe and MCM-41-Al) and non-functionalized MSNs (MCM-41) were used for the present study. Non-functionalized MSNs (i.e. MCM-41) and functionalized MSNs (MCM-41-Fe and MCM-41-Al) were synthesized and then characterized by Brunauer-Emmett-Teller (BET) and scanning electron microscope (SEM) analysis. BET analysis showed particle diameter (50-200nm), pore diameter (2.97 - 3.6 nm), pore volume (0.897 – 1.238cm^3/g) and specific surface area (1036 – 1067 m^2/g). SEM analysis showed the spherical particles. Load the test drugs (i.e. ibuprofen, flurbiprofen and naproxen sodium) into these synthesized MSNs to check the adsorb ability of the particles. Non-functionalized MSNs showed higher percentage of drug loading (i.e. 91%) whereas lower percent of loading was observed in iron functionalized MSNs (35%). After that, checked the release profile of drug loaded particles. Finally, all release data were fitted onto two kinetic model i.e. first order kinetic model and Higuchi model. Characterization of MSNs i.e. MCM-41-Al, MCM-41 and MCM-41-Fe showed that pore diameter was 3.6nm, 3.44nm and 2.97nm, respectively. It was found that potential of ibuprofen loading also correlate with pore diameter. However, non-functionalized MSNs loaded by flurbiprofen and naproxen had lower %age of drugs. Release profile depends on the pH condition. Results were not following the release profile as mentioned by first order kinetic model and Higuchi model. Therefore, it was concluded that drug loading depends on pore diameter and surface functional group as more pore volume can load more drug, and increased pH increased the profile released rate but not followed the kinetic model.