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Controlled Release of Diclofenac Sodium from The Mg-Al Layered Double Hydroxide Nanocomposites Synthesized Using PVP- SDS Soft Template

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Controlled drug delivery systems have gained great attention in the pharmaceutical industry. The objectives of this research were to synthesize Mg-Al layered double hydroxide (LDH) nanocarriers using sodium dodecyl sulphate (SDS) and poly vinyl pyrrolidone (PVP) as the soft template, preparation of nanocomposites with diclofenac sodium and to evaluate these composites for controlled delivery. LDH was synthesized using PVP-SDS soft template via the coprecipitation method, calcined, and then reconstructed with an ethanolic solution of diclofenac sodium. Pristine Mg-Al-LDH was synthesized using the same method without the template. XRD, FTIR, SEM, TGA, and BET techniques were used for characterization and drug loading capacities were analyzed. *In vitro* drug release was conducted in pH 6.8 and 7.4 media at 37°C simulating intestinal conditions. XRD and FTIR data showed the successful synthesis of LDHs. Sample prepared via template method showed high drug loading (54.2%), compared to pristine LDH (29.9%). SEM images showed the presence of spherical particles as well as a microstructure with an irregular surface. The specific surface area of the calcined sample of LDH synthesized via the template method measured by BET was 124.540 m^2/g and this large surface area and drug loading were further confirmed by the TGA data. The *in vitro* drug release studies showed a slow releasing behavior of the drug in both media for period of 8 hours. It can be concluded that the template synthesized LDH with a high surface area could be identified as good nanocarriers for the controlled release of diclofenac sodium.

Keywords*: layered double hydroxides, Sodium Dodecyl Sulphate, Poly Vinyl Pyrrolidone, diclofenac sodium, controlled release*