



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: **Nanoparticles Based MIL-100(Fe) MOFs Composites for Loading and Release of Doxorubicin Hydrochloride**

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SHORT ABSTRACT

A drug delivery system (DDS) is defined as controlled release of desired drugs to targeted location by responding to the external/environmental stimulus. Porous materials based DDSs have got more attentions in recent times owing to their high surface area, large pore volume and tunable pore size. Metal organic frameworks (MOFs), a new class of porous material that are being widely investigated for drug delivery applications. In this work, iron based metal organic framework (MOF) MIL-100(Fe) and its composites with Iron oxide (Fe_3O_4), Zinc oxide (ZnO) and Cerium oxide (CeO_2) nanoparticles (NPs) were investigated as delivery agents for anticancer drug doxorubicin hydrochloride (DOX). A series of composites like Fe_3O_4 @MIL-100, ZnO@MIL-100 and CeO_2 @MIL-100 were synthesized by adding different amount of nanoparticles to the solvent mixture used for synthesis of the MIL-100. The composites were further characterized by various techniques like BET, TEM, FESEM, VSM (for magnetic particles) and TGA etc. It was observed that synthesis procedure of MIL-100 significantly affected its porosity and thereby its drug loading capacity. MIL-100(Fe) prepared without HF as the mineralizing agent yielded MOF with higher mesoporosity and it has highest DOX loading capacity among pure MOFs (~ 234 mg/g). In case of composites, synthesis using lower mesopores MOF, the inclusion of Fe_3O_4 and ZnO nanoparticles enhance the mesopores and hence the drug loading capacity is increased by ~75%. However, in case of CeO_2 in to the MOF structure changed the morphology of the nanoparticle into needle like structure. Therefore, no enhance in DOX loading capacity was observed possibly due to blocking of pores by particles. In case of composites synthesis using high mesoporous MIL-100, inclusion of nanoparticle decreased the drug loading capacity. The inclusion of nanoparticles in the mesopores possibly block its adsorption sites, which resulted in a net decrease in DOX capacity.

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