

One-step dry synthesis of iron based nano-biocomposite for control release of drugs

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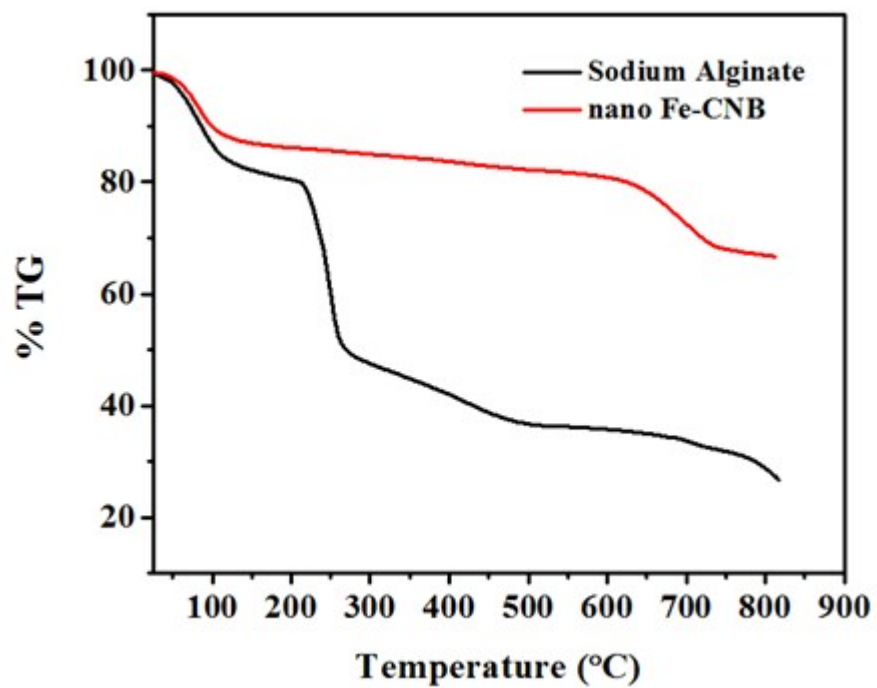


Fig. S1. TGA analysis of sodium alginate and nano-Fe-CNB indicating the stability of the developed nano Fe-CNB, as the final mass loss observed for biopolymer sodium alginate is observed to be 26.9 % while for nano Fe-CNB is 66.7%.

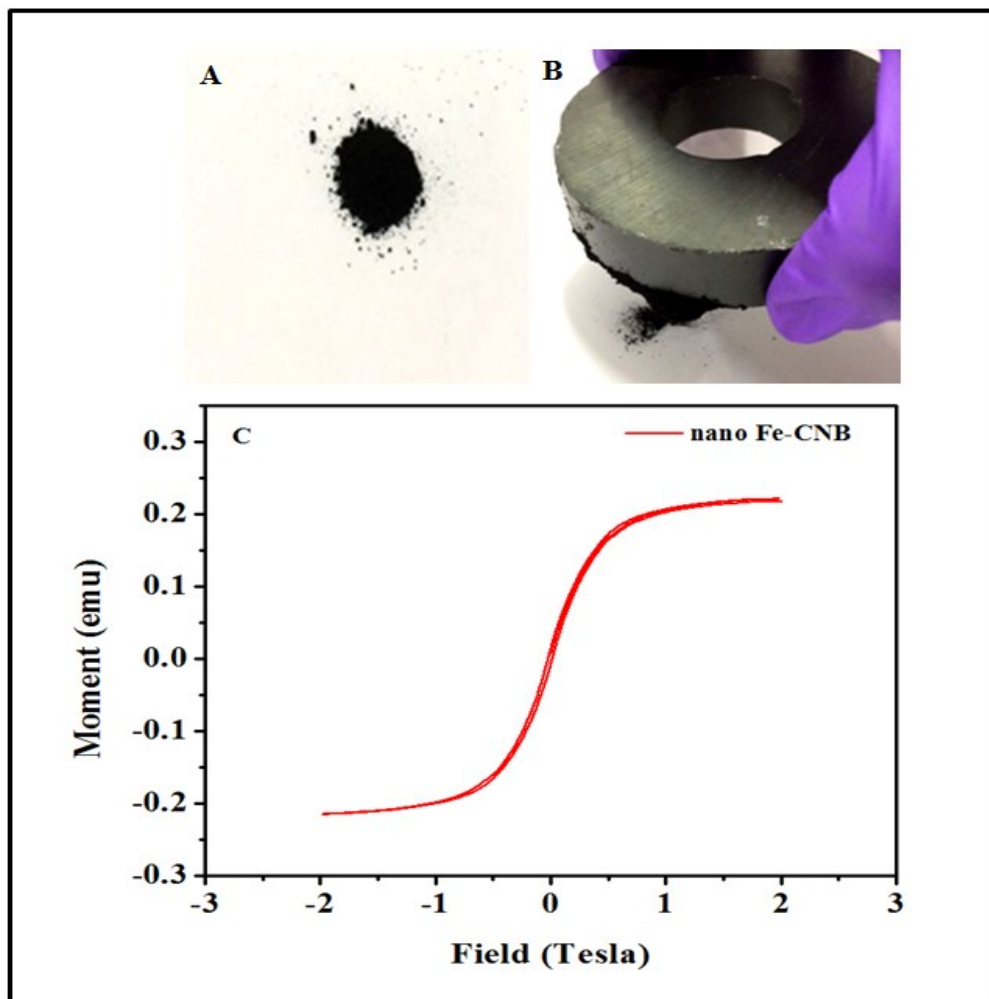


Fig. S2 (A) The prepared nano Fe-CNB powder is taken in some amount (B) A big magnet is brought near the nano Fe-CNB powder it is observed that in the presence of magnet the nano Fe-CNB powder attracts the big magnet surface (C) Depicts the magnetic behavior of nano Fe-CNB at different magnetic field and saturation magnetization exhibits the super magnetism behavior of nano Fe-CNB.

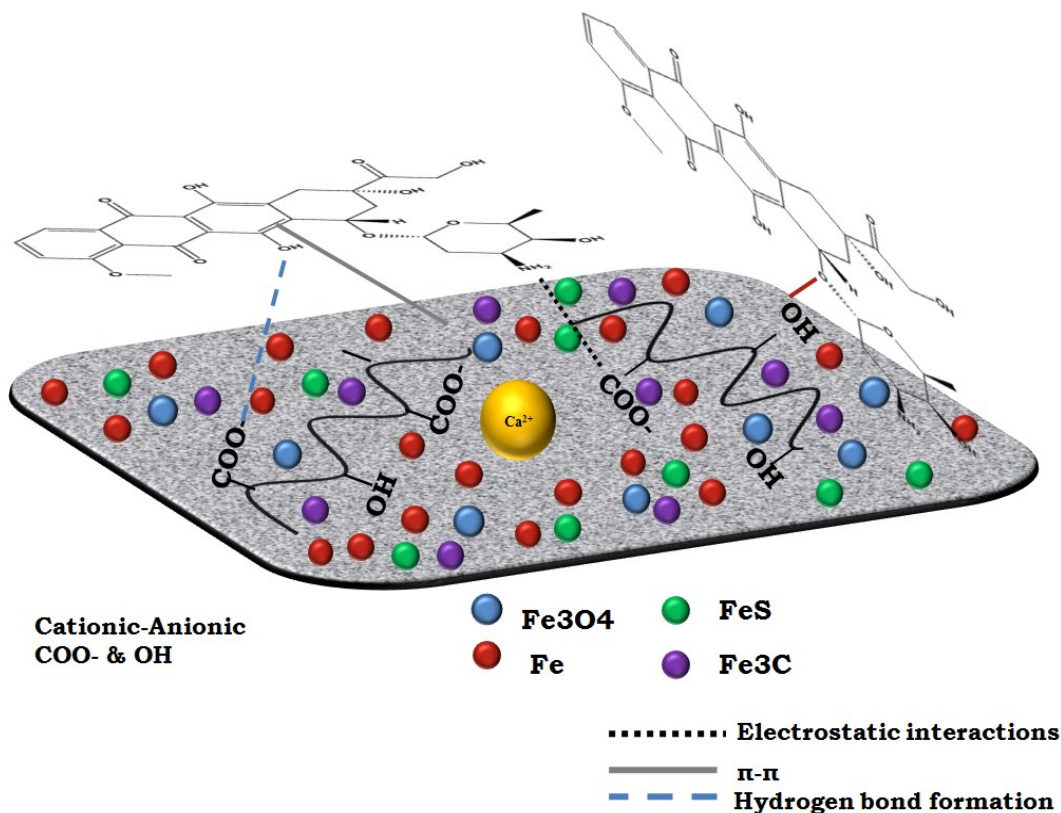


Fig. S3 Schematic view of a DOX-loaded nano Fe-CNB embedded CA hydrogel and interaction mechanism existing between DOX and nano Fe-CNB embedded CA such as electrostatic interactions, hydrogen bond formation and π - π interactions.

Alginate is an anionic polymer undergoes electrostatic interactions with cation Ca^{2+} ion of the CaCl_2 solution, and hydrogel bead is formed due to the egg-box model. The drug (DOX) is loaded onto a nano Fe-CNB embedded CA matrix due to the following interactions. DOX being cationic drug and alginate being anionic, there exist strong electrostatic interactions between them, which facilitates drug loading. The π - π interactions take place between the DOX and the layered material. The hydrogen-bond formation takes place among COO^- group of polymeric chain and OH^- group of DOX.

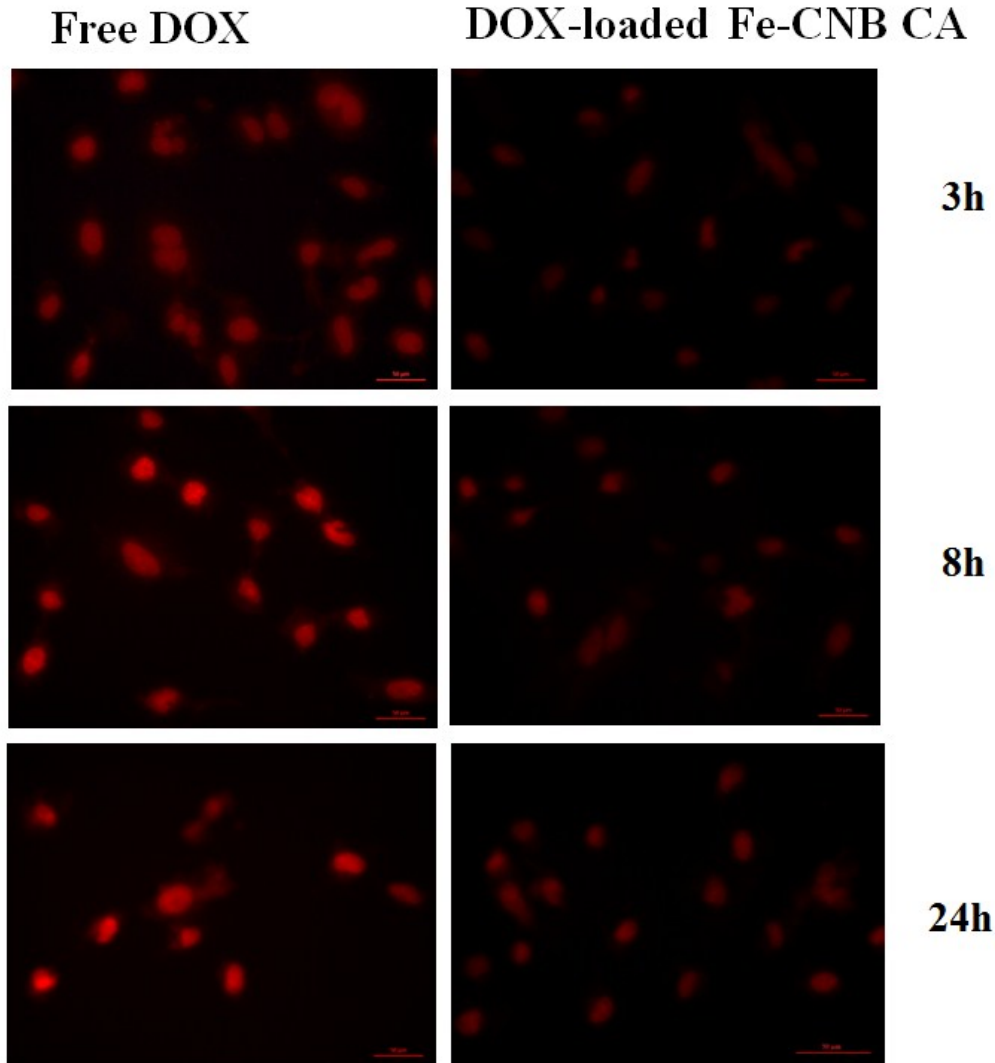


Fig. S4 Fluorescence microscopy images of HeLa cells when subject to treatment at different time intervals of 3 h, 8 h, and 24 h from Free DOX and DOX-loaded Fe-CNB CA exhibiting control release of DOX from DOX-loaded Fe-CNB CA by the intensity of fluorescence.

The fluorescence signal appears to be stronger for cells treated with free DOX as compared to that of DOX-loaded Fe-CNB CA for 24 h. This is because the uptake of DOX by cells is through passive diffusion via cell membranes, which is observed to be faster in free DOX as compared to DOX-loaded Fe-CNB CA beads. DOX is observed to localize prominently inside nuclei of cells, and over a period of time, free DOX exhibit faster and higher localization. The fluorescence signal of DOX-loaded Fe-CNB CA increases over a period of time, indicating the gradual and

controlled release of the “fluorescent drug-DOX” from DOX-loaded Fe-CNB CA. Thus, the studies highlight the efficacy of nanotherapeutic system to release the drug in a controlled manner.