

MAGNETOLIPOSOMES BASED ON MAGNETITE NANOPARTICLES

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Abstract

Liposomes entrapping magnetic nanoparticles (magnetoliposomes) are of large importance in drug delivery, as they can be guided and localized to the therapeutic site of interest by external magnetic field gradients and used in cancer treatment by hyperthermia [1,2].

In this work, magnetic nanoparticles of magnetite (Fe_3O_4) were prepared by soft chemical methods, using different surfactants as templating media. These nanoparticles were either covered with a lipid bilayer, forming dry magnetoliposomes, or entrapped in liposomes - aqueous magnetoliposomes. The systems were characterized by DLS and SEM and the magnetic properties of the magnetoliposomes were evaluated by SQUID.

SEM images of the dry magnetoliposomes prepared are shown in Figure 1.

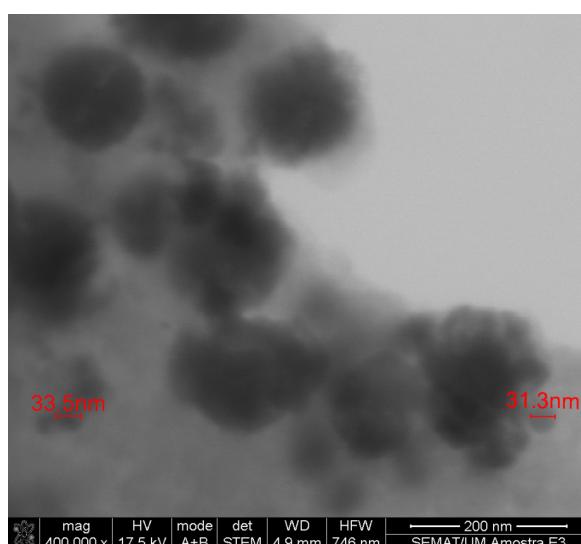


Figure 1. SEM images of dry magnetoliposomes.

The hysteresis loop obtained by SQUID measurements (Figure 2A) shows superparamagnetism of the magnetoliposomes composed of magnetite nanoparticles covered by the phospholipid DPPC (16:0 PC, dipalmitoylphosphatidylcholine). A blocking temperature of near 118 K was determined for the magnetite nanoparticles (Figure 2B).

Preliminary assays of the non-specific interactions of magnetoliposomes with biological membranes (modeled by giant unilamellar vesicles, GUVs) were performed. FRET (Förster Resonance Energy Transfer) assays using GUVs containing phospholipids labeled with fluorescence probes and other fluorescent molecules incorporated in the magnetoliposomes have revealed the occurrence of fusion between the magnetoliposomes and the GUVs.

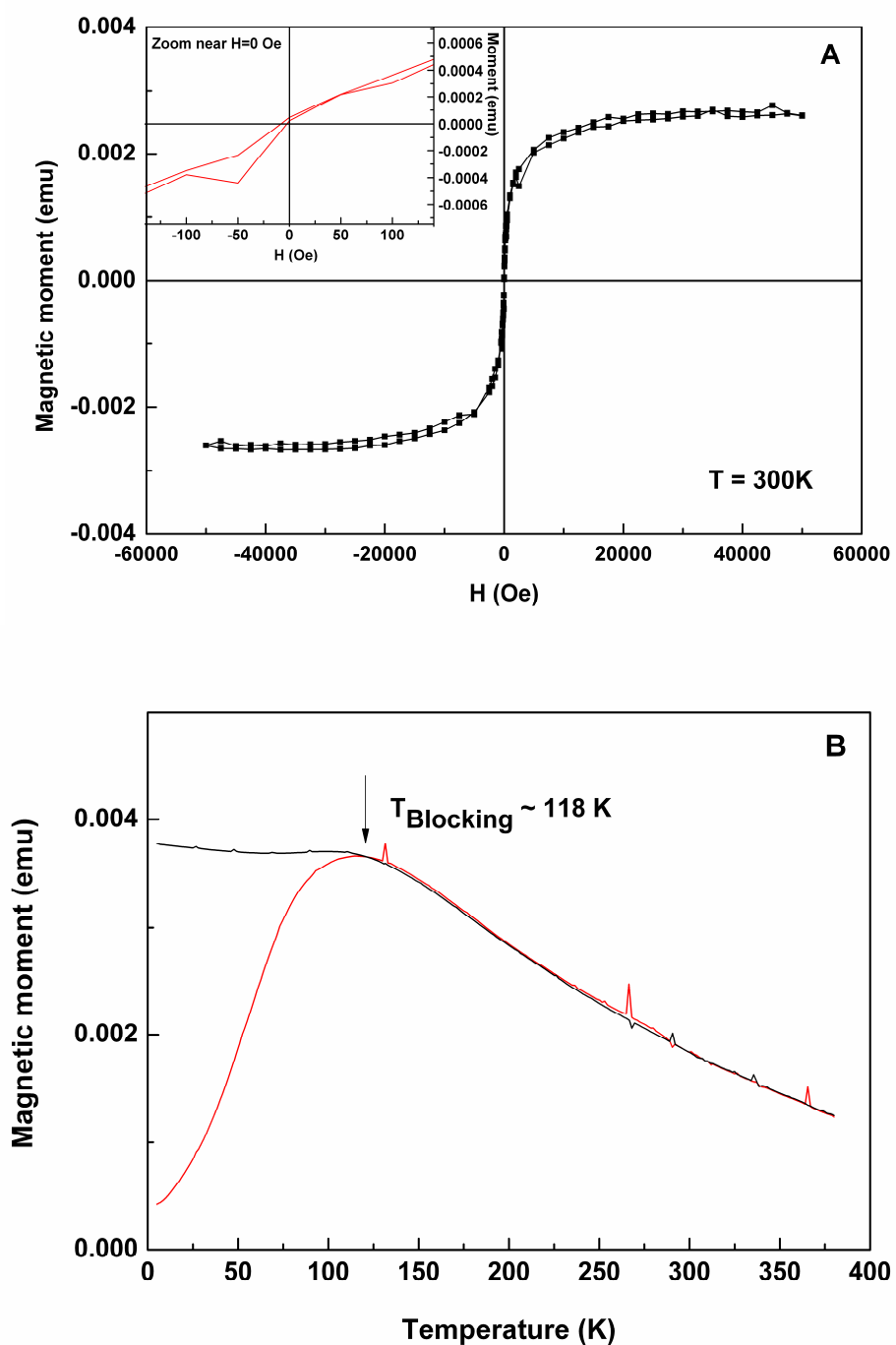


Figure 2. A. Hysteresis loop of dry magnetoliposomes (magnetite nanoparticles covered by DPPC) at room temperature. **B.** Magnetic moment vs. temperature of magnetite nanoparticles.

Acknowledgements: FCT, FEDER, COMPETE/QREN/EU for financial support to CFUM (PEst-C/FIS/UI0607/2011) and to the research project PTDC/QUI/81238/2006 (FCOMP-01-0124-FEDER-007467).

References

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