XXI B-MRS Meeting 2023

October 1st to 5th

SBPMat
B-MRS

BRAZILIAN MATERIALS
RESEARCH SOCIETY

PROCEEDINGS

Sociedade Brasileira de Pesquisa em Materiais

Proceedings of the XXI B-MRS Meeting

Maceió, AL
2023

Study of interparticle magnetic coupling by DPC-STEMof self-and magnetic-induced assemblies of Fe_3O_4 nanocrystals.

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Fe_3O_4nanocrystals (NC) can be used as patterns for fundamental studies of magnetic properties on the nanoscale because of two main characteristics: i) Fe_3O_4presents magnetocrystalline anisotropy being its direction of easy magnetization, thus cubic and spherical NC must have different magnetic behavior ii) the critical diameter of $Fe_3O_4$is around 25 nm, below this the NC is a magnetic monodomain. DPC-STEM could be a powerful tool to investigate magnetic phenomena because it allows obtaining information about interactions between electrons beam and different local magnetic orientations.[1] However, it should be noted that DPC is not trivial, because the TEM lenses are electromagnets and some TEM components are ferromagnetic material, thus is necessary to ensure that the magnetic field (MF) arising from these components does not affect the analyses.[2] Here, we aim to investigate how an external MF affects the formation of self-assembly of Fe_3O_4NC, taking into account the NC shape as well as to evaluate interparticle magnetic coupling at room and low temperatures (~196 ℃) by DPC-STEM. Both spherical and cubic monodisperse 10 nm NC were obtained, and initial results of DPC-STEM of self-assembly NC on the TEM grid. STEM conditions are being improved. The next steps are to obtain the assembly of NC in thin films with and without the external MF.[3] FC-ZFC measurements also will be performed for corroborates DPC-STEM data and help in phenomenological interpretation.

Acknowledgments:
FAPESP (2021/03321-9) and FINEP (MQSMEML)

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