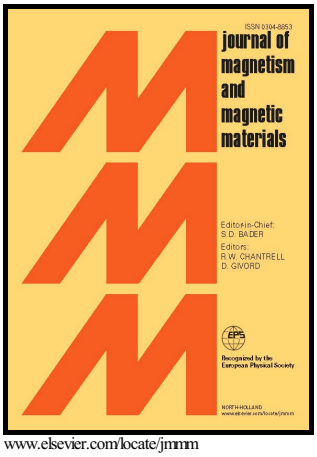

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Template-free synthesis of sub-micrometric cobalt fibers with controlled shape and structure. Characterization and magnetic properties

Allagui Lakhdar[a], Joao P. Borges[b], Abdesslam Ben Haj Amara[a], Amel Dakhlaoui-Omrani[c,d*]

[a]Laboratoire de Physique des Matériaux Lamellaires et Nano-Matériaux Hybrides, Faculté des Sciences de Bizerte, Université de Carthage, 7021 Bizerte, Tunisie
[b]i3N/CENIMAT, Department of Materials Science, Faculty of Science and Technology, Universidade NOVA de Lisboa, Campus de Caparica, 2829-516 Caparica, Portugal
[c]Department of Chemistry, Faculty of Sciences and Arts-Khulais, University of Jeddah, Khulais, P. O. Box 355, Postal Code 21921, Kingdom of Saudi Arabia
[d]Laboratoire de Physico-Chimie des Matériaux Minéraux et leurs Applications, Centre National des Recherches en Sciences des Matériaux, Technopôle de Bordj Cedria, BP 73, 8027 Soliman, Tunisie
dakhlaoui_amel@yahoo.fr
amelomrani73@gmail.com
[*]**Corresponding author**: Tel.: +966538474717

Abstract

Sub-micrometric Co fibers were prepared via a modified polyol process at 90 °C under an external magnetic field of about 550 Oe, using ethelyne glycol as solvent and hydrazine as reducing agent. The structure, the size and the morphology of the as-elaborated products were highly controlled through properly monitoring the synthesis parameters (amount of NaOH added, the amount of the reducing agent, precursor' concentration and precursors mixing protocol). The XRD characterization confirmed the formation of pure cobalt powders with either hexagonal compact (hcp) or face-centered-cubic (fcc) structure depending on the concentration of the metal precursor and sodium hydroxide. The scanning electron microscopy observations of the powders shows sub-micrometric fibers with about 0.4 to 0.6µm in diameter and a length that could reach 15 µm. Fibers prepared at high reducing ratio were constituted of flower-like spheres that coalesce in the direction of the applied magnetic field. For their high contact surface, these fibers offer new opportunities for catalysis applications. The hysteresis loop measurements show an enhancement of the ***Hc*** of the as-obtained fibers compared to their bulk counterparts and permit to confirm the relationship between the structure and the magnetic properties of the materials.

Keywords: Magnetic materials, anisotropic growth, soft chemistry, magnetic properties

1. Introduction