Secteur des Sciences et Technologies

Invitation à la soutenance publique de thèse de

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Master ingénieur civil en chimie et science des matériaux

Pour l'obtention du grade de Docteur en sciences de l'ingénieur et technologie

« 3D interconnected magnetic nanowire networks »

qui se déroulera

le mercredi 01 avril 2020 à 15h

Auditoire DOYEN 21

Place des Doyens

1348 Louvain-la-Neuve

Jury members :

Prof. Luc Piraux (UCLouvain), supervisor
Prof. Arnaud Delcorte (UCLouvain), chairperson
Prof. Benoit Hackens (UCLouvain), secretary
Dr. Flavio Abreu Araujo (UCLouvain)
Prof. Joaquin De la Torre Medina (Univ. Nacional Autonoma de Mexico – Mexico)
Prof. Joseph Heremans (The Ohio State Univ. – USA)

Track-etched polymer membranes with crossed nanochannels have been revealed suitable as templates for the electrodeposition of interconnected magnetic nanofiber networks with controlled morphology, material composition and nano-architecture. Three-dimensional networks of nanowires, core-shell nanocables, nanotubes and multilayered nanowires have been successfully fabricated. The interconnected structure provides the mechanical stability and electrical connectivity to the self-supported three-dimensional nano-architectures, while the polycarbonate template provides flexibility to the system. In addition, the local removing of the cathode enables a two-probe design suitable for electric and thermoelectric measurements, with the electric current flow restricted along the nanofiber segments. The tunability of the magnetic and magneto-transport properties, notably the magnetic anisotropy, of various three-dimensional interconnected magnetic nanofiber networks has been demonstrated. The unique architecture of the three-dimensional nanofiber network system has been found suitable for a wide range of applications such as three-dimensional magnetic sensoring, magnetic devices with controlled anisotropy and microwave absorption properties. Moreover, the good electrical connectivity between the nanofibers and the tunable magnetic and magneto-transport properties of the three-dimensional interconnected nanofiber networks make them good candidates for light and flexible spintronics, thermoelectric and spin caloritronic devices, with large magnetically modulated thermoelectric power factors. Those three-dimensional networks allow magnetically-controlled Peltier cooling of macroscopic components with large Peltier cooling ability and the direct extraction of accurate key spin caloritronics parameters such as Seebeck coefficients for the spin up and spin down electrons. Those observations hold promise for magnetically modulated refrigeration using light and flexible thermoelectric generators and may lead to advances in future spin-caloritronic devices. In addition, three-dimensional nanofiber networks have been revealed suitable as light and planar thermoelectric modules for active cooling devices that are completely integrated into a flexible films.