



Contribution ID: 492

Type: not specified

Intelligent magnetic materials

Monday, 7 July 2014 15:00 (1 hour)

Abstract content (Max 300 words) **Formatting & Special chars**

Magneto-Rheological materials consist in magnetic particle embedded in a non-magnetic medium, where this host in Magneto-Rheological Elastomers (MRE) is a mechanically soft polymer and in Magneto-Rheological Fluids (MRF), the host is a viscous liquid. These materials properties take benefice of the two components. MRE are known to present a magnetically-induced stiffening [1] and an apparent magnetostriction [2]. The key, here, is the dipolar interaction of the magnetic particles exposed to the external magnetic field. This interaction is sensitive to the particle distribution (random, chain, sheet,...) inside the composite [2,3,4] yielding to different types of behaviour. MREs through their unique properties are leading to a new generation of sensors, actuators (artificial muscles) and energy harvesting systems.

Magneto-Rheological Fluid (MRF) provides a new damping system where, in contrast to regular damping system, the fluid viscosity is magnetically tuneable due to the formation of particles structure. Biology also has a great use of these magnetic fluids; (i) contrast agent for Nuclear Magnetic Resonance Imaging, (ii) the so-called Magnetic Drug Targeting (MDT) which is a medical technique based on the simple concept of attaching a therapeutic drug to a small magnetic carrier that is dragged to a precise location by external magnetic field gradient [5]. (iii) The magnetic particles can also be used for localized hyperthermia in a cancer treatment: when the particles reach the specified area, an AC magnetic field is then applied to overheat the cancer cell which kill them or at least weaken them [6].

These two categories of material are intensively studied for optimizing the physical properties or directly into devices.

References

- [1] Han Y et al. 2013 Int. J. Solids Struct. 50 2281
- [2] Martin JE et al. 2006 Phys. Rev. E 74 051507
- [3] Zhou GY, Jiang ZY 2004 Smart Mater. Struct. 13 309
- [4] Varga Z et al. 2005 Polymer 23 347
- [5] Kempe H, 2010 Biomaterials 31 9499
- [6] Sharifi I et al. 2012 J. Magn. Magn. Mat. 324 903

Primary author: Dr DIGUET, Gildas

Presenter: Dr DIGUET, Gildas

Session Classification: Winter School: Magnetism