

ISBN 978-85-63274-02-4



# **International Conference on Food and Agriculture Applications of Nanotechnologies**

Editors:

**Caue Ribeiro**

**Odílio Benedito Garrido de Assis**

**Luiz Henrique Capparelli Mattoso**

**Sergio Mascarenhas**

São Pedro, SP  
2010

1st Edition  
1st print: 500 copies

Anais da 1. International Conference of Food and  
Agriculture Applications of Nanotechnologies –  
São Pedro: Apor Software, 2010.  
284 p.

ISBN 978-85-63273-02-4

1. Nanotechnologies – Events. 2. Ribeiro, Caue. 3.  
Assis, Odílio Benedito Garrido de. 4. Mattoso, Luiz  
Henrique Capparelli. 5. Mascarenhas, Sergio



**Agriculture applications of drug-delivery systems based on ferromagnetic graphite**

R. T. Paschoalin<sup>(1,2)\*</sup>, H. M. Brandão<sup>(3)</sup>, F. M. Araújo-Moreira<sup>(1)</sup> and P. S. P. Herrmann<sup>(2)</sup>

(1) Department of Physics, Federal University of São Carlos.

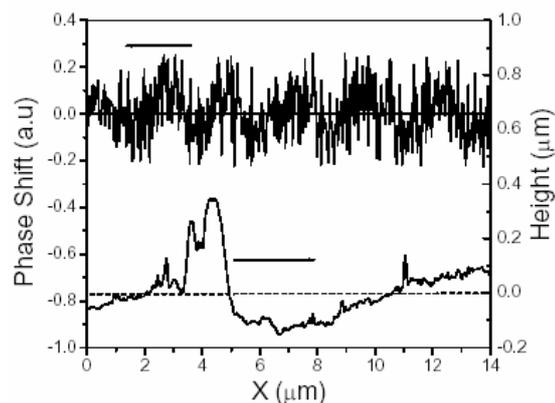
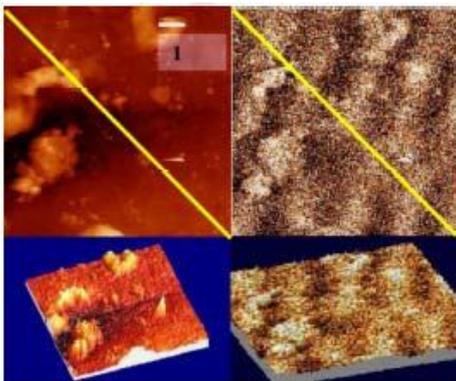
(2) National Nanotechnology Laboratory for Agribusiness (LNNA), Embrapa Agricultural Instrumentation, P. O. Box 741, 13560-970, São Carlos, e-mail: rafa\_rrtp@hotmail.com.

(3) Embrapa Dairy Cattle, Juiz de Fora – MG.

**Abstract** – The development of bionanotechnology has allowed the application of nano-materials in medicine in different subject like transport and control of releasing drugs as well as the recognition and destruction of cells and tumor tissues. A very interesting alternative is the used of drug delivery systems based on nano-particles of ferromagnetic graphite. This system would allow directly delivering the drug and reaching the infected cell by controlling an external magnetic field given to the drug specificity-like features.

Nanoscience and nanotechnology have been considered the science of the future, with numerous applications. As a result of their application together with biology, the new area called bionanotechnology has a promising broad field of research mainly in medicine. One of the most relevant subjects in that area is related to the used of nano-materials for transport and control of releasing drugs. Those materials can be used in the recognition and/or the destruction of cells and tumor tissues [1]. Nanostructured carbon magnetic materials have increasingly attracted the interest of the scientific community, not only because of their physical properties but mainly because of their potential applications in high-tech devices. To cite just a few of them, these carbon based materials could be used in nanotechnology, sensors, detectors, actuators, among others, for applications in medicine magnetic imaging or even applications in telecommunications, electronics, biosensors, magnetic materials separation and principally as drug delivery systems since they act directly on the desired cells with the use of an external magnetic field [2]. This fast expansion of bionanotechnology has led to growing concerns for not knowing the extent of the adverse effects of the use of nano-particles. Therefore, it is necessary to perform extensive research for these materials [3].

The main goal of the present work is the characterization of nano-particle ferromagnetic graphite using Scanning Probe Microscopy technique [4], mainly atomic force microscopy and magnetic force microscopy (Figure 1 and 2), assessing permeability and toxicity using udder of bovine animals.



**References**

- [1] G. Oberdorster; V. Stone; K. Donaldson. *Nanotoxicology*, **1**, (2007), p. 2-25.
- [2] M. Knobel and G. F. Goya. *Scientific American Brasil*, (2004) p. 58-66.
- [3] W. Momburú; F. M. Araújo-Moreira; O. F. Lima. *Physical Review B* **71**, (2006), p.565-569.
- [4] F.L. Leite; P.S.P. Herrmann. *Journal of Adhesion Science and Technolog*, **19**, (2005), p. 365-405.