1st International Conference on Nanostructured Materials and Nanocomposites

ICNM-2009

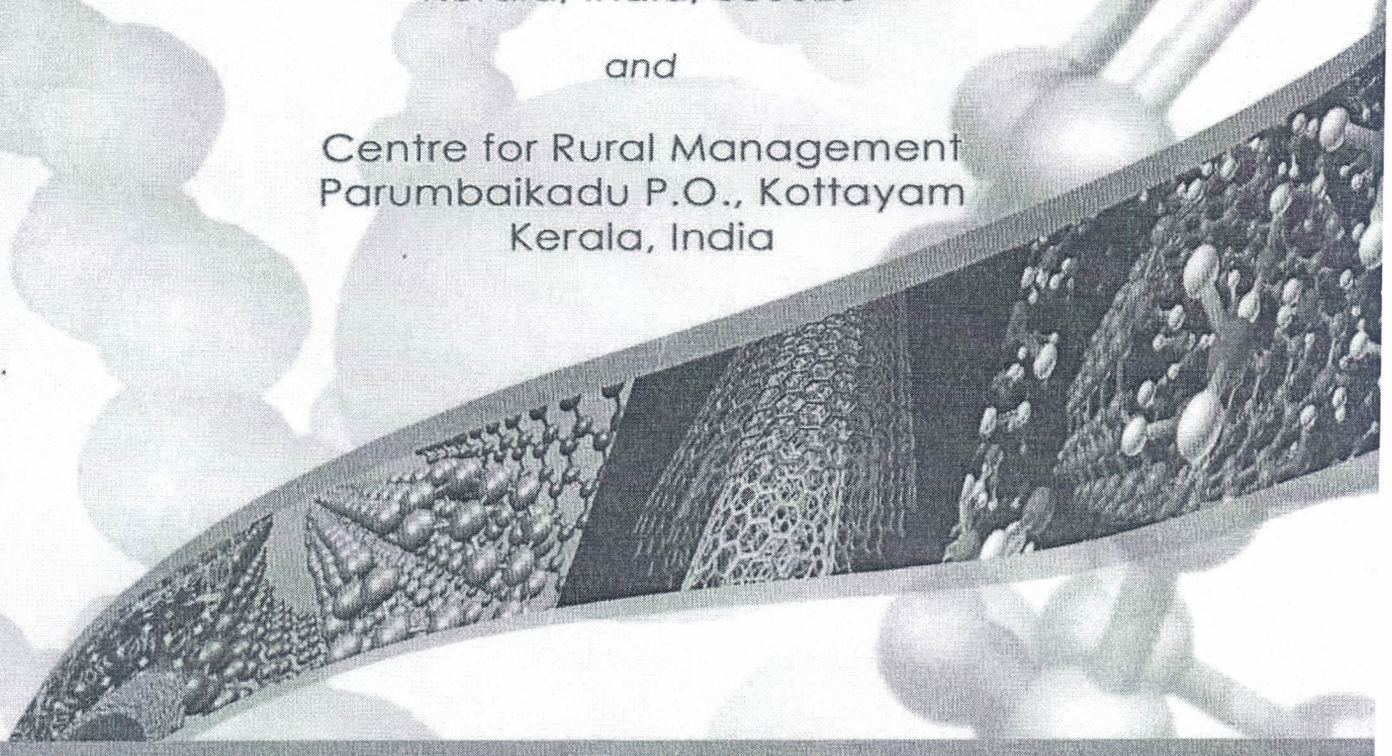
April 6, 7 and 8, 2009

Organised by

Institute of Macromolecular Science and Engineering (IMSE)
Parumbaikadu P.O., Kottayam
Kerala, India, 686028

and

Centre for Rural Management
Parumbaikadu P.O., Kottayam
Kerala, India



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Functional Polymer Nanofibers through Electrospinning: A Route to Produce Versatile Nanocomposites

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The development of viable nanotechnologies passes through the development of processing techniques, which can be used in desired production scales with reproducibility, especially in the cases where the final product is still at the nanoscale. This is the case of nanofibers, which can be used in nonwoven products, sensors, catalytic supports and other producs. Several processes are used to produce polymer nanofibers, however, one of the most successful is the electrospinning process, based in the Corona effect developed when a high voltage is applied to a polymer solution or melt. The fibers processed in this condition can easily attain diameters ranging from 10 to 500 nm and high surface area-to-volume ratio.

The processing of nanocomposite solutions (polymer matrices with synthetic nanoparticles) using this technique shows a interesting physical confinement effect, since the loaded materials are of the same size order of the final fiber. It is especially interesting to join the surface properties of the loaded nanoparticles with the general applications of nanofibers, and some bactericidal nanoparticles, such as anatase TiO_2 or metallic Ag nanoparticles.

In this study, composite nanofibers of PVA/TiO_2 and PVA/silver (Ag) were prepared successfully by electrospinning in optimized conditions. The nanoparticles used as loadings were synthesized and characterized, showing effective sizes below 20 nm. The nanofibers were characterized by SEM, EDS, XRD and UV-Vis diffuse reflectance spectroscopy, showing that the technique can be used to produce fibers in diameters below 100 nm with good reproducibility. The bactericidal and catalytic activities of the nanofibers were investigated, showing some oxidative active against Rhodamine B dye (in the case of PVA/TiO_2 nanofibers) and good bactericidal activities against Staphylococcus aureus (87.8%) and Escherichia coli (85%) (in the case of PVA/Ag nanofibers). The versatility of the technique showed also the possibility of a future use as a coating system for different polymers, in order to modify their surface properties.

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