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CERTIFICATE

This is to certify that the project report entitled ***"Synthesis and Characterization of Iron Nanoparticle in Polymer Matrices"*** being submitted by **Gitanjal Deka** to Department of Physics, Tezpur University, Assam, in fulfillment of the requirements for the award of the degree of Master of Science, is a record of original bonafide work carried out by him. He has worked under my supervision and has fulfilled the requirements for the submission of the report. The results contained in this report have not been submitted in part or full to any other university or institute for award of any degree or diploma.

I wish him success in life.

Niranjan Karak 12/12/08
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Gitanjal Deka
12-12-08

PREFACE

Nanoscience and technology has become a very broad and interdisciplinary field of research and emerging applications in the recent years. It is one of the most visible and growing research areas in material science in its broadest sense. Nanostructured materials include atomic clusters, layered (lameller) films, filamentary structures, and bulk nanostructured materials. The nanoscale dimensionality is less than 100 nm, more typically less than 50 nm. The physics of these nanoscale material can be very different from the macroscale properties of the same substance.

The fundamental knowledge on the preparation and nature of metal–polymer nanocomposites has a long history that is connected to the names of many famous scientists. Metals undergo the most considerable property change by size reduction, and their composites with polymers are very interesting for functional applications. The new properties observed in nano-sized metals (mesoscopic metals) are produced by quantum-size effects. These properties are size-dependent and can be simply tuned by changing the dimension.

A limited number of methods have been developed for the preparation of metal–polymer nanocomposites. Usually, such techniques consist of highly specific approaches, which can be classified as in situ and ex situ methods. In the in situ methods, two steps are needed: First, the monomer is polymerized in solution, with metal ions introduced before or after polymerization. Then metal ions in the polymer matrix are reduced chemically, thermally, or by UV irradiation. In the ex situ processes, the metal nanoparticles are chemically synthesized and their surface is organically passivated.The derivatized nanoparticles are dispersed into a polymer solution or liquid monomer that is then polymerized.

Finally, polymer-embedding represents a simple but effective way to use mesoscopic properties of nano-sized metals. A large variety of advanced functional devices can be based on this simple material class. In the last few years, a number of pioneering techniques have been developed for preparing metal–polymer nanocomposite materials. In particular, the in situ techniques seem to be a very promising approach to produce metal-polymer nanocomposites on a large scale.

Gitanjal Deka