Magnetic Behavior of PAN-based Nickel Coated Carbon Fiber/Nylone66 Composite

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Introduction

Transition metal containing macromolecules belongs to a rapidly developing class of advanced materials [1,2]. These materials have been reported to exhibit novel magnetic, electrical, optical, electro-optical and crystal properties. The development of these materials is mainly oriented toward the fiber filled composites. The widely used fibers are metallic, carbon and PAN-based carbon embedded on thermoplastic polymers as polypropylene, nylon, polyethylene and polycarbonate.

Experimental

The material used in the present work is a PAN-based nickel coated carbon fiber/Nylone66 composite. Fibers were chopped into short pieces of 0.2-2 mm length and dispersed randomly in Nylone66 resin. The Magnetization measurements were performed using the VSM at the 14T superconducting magnet at the Pulse Field Facility, NHMFL, Los Alamos National Laboratory.

Results and Discussion

The Fig.1a shows the magnetic susceptibility for different concentrations of a PAN-based nickel coated carbon fiber/Nylone66. Above 50 K, we find Curie-Weiss behavior for the 5% concentration, while this behavior is observed above 80 K for the 30% concentration. The magnetization curves measured at 10 and 300 K for the 10% concentration are displayed in Fig.1b. The curve at 10 K indicates a ferromagnetic behavior where the magnetization saturates at about 5 T. Further analysis is necessary for these measurements.

Fig. 1: a) Temperature dependence of the magnetic susceptibility for different concentrations of a PAN-based nickel coated carbon fiber/Nylone66. b) Field dependence of the magnetization of a 10% PAN-based nickel coated carbon fiber/Nylone66 at 10 and 300 K.

References