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GROWTH AND CHARACTERIZATION OF CARBON NANOTUBES AS HYDROGEN STORAGE SYSTEM

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ABSTRACT

Hydrogen is expected to become an ideal candidate for renewable and cleaner energy carrier and to progressively replace the existing fossil fuels, at least when the issue of how it can be stored safely and cheaply is resolved. So far only few technologies for storing hydrogen fuel have been adopted by automobile factories [1], but these systems present significant disadvantages.
Most recently, tremendous interest have been aroused by the discovery of the hydrogen adsorption capacity in carbon materials [2], such as nanoporous carbon or nanofibers, and particularly carbon nanotubes (CNTs) because of their unique physical/chemical properties and their potential applications. In particular, since their very low density and high porosity, they are potentially useful as a safe hydrogen storage [3], although in the literature the actual amount of hydrogen uptake in CNTs varies significantly.

In this work we report about growth of carbon nanotubes, carbon fibers and nanographite obtained by thermal CVD [4] by co-evaporating of either solid or liquid carbon precursor in presence of metal catalysts, such as ferrocene. The morphology and structure of our samples, grown at different conditions, were characterized by SEM, HR-TEM and BET analyses. Furthermore spectroscopic tools were employed both in characterization of carbon nanotubes and their interaction with hydrogen atmosphere, in order to investigate the mechanism in which hydrogen is adsorbed onto different kind of nanotube samples. Physical and chemical properties were investigated by Raman, FT-IR and ESR spectroscopy.

INTRODUCTION

Nowadays the global environment problem caused by the utilization of fossil fuels is moving the research towards possible alternative sources of energy. Because of its several advantages, hydrogen is the best candidate as fuel and versatile energy carrier [1].
Currently, the main approaches of hydrogen storage in ideal vehicles are compressed gas, liquid or in the form of solid system. A solid hydrogen storage system is reliable, simple to engineer and tremendously safe. Examples of solid hydrogen storage are metal hydrides, glass microspheres and various