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Catalyst Effect on Carbon Nanomaterials Production by Chemical Vapor Deposition

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Abstract. Carbon nanomaterials (CNMs) such as carbon nanotubes (CNTs) and carbon nanofibers (CNFs) have attract many interests due to their unique mechanical, chemical, electrical, magnetic, thermal and other properties. They have been applied in various fields such as electronics, medicine and catalysis. Intense research effort have been undertaken to synthesis CNTs at a reasonable cost. Currently chemical vapor deposition (CVD) is the most widely used method, which is promising way for large scale production and high purity of CNMs at low cost and easy to handle. Catalyst used in CVD method give high significant role in determination of the yield and the types of CNTs produced. Iron oxide (Fe_2O_3) and nickel oxide (NiO) powder have been used to investigate the growth of CNMs. The samples were growth by using methanol as a precursor at temperature 700 °C for 30 minutes deposition time. As a result, CNTs can be found grow at small size of catalyst (less 10 nm). Bigger size of catalyst (above 20 nm) lead to encapsulated of metal carbide. Amorphous carbon was formed around the catalyst that have size in micro scale. All sample were analyzed using high resolution transmission electron microscopy (HRTEM) images and energy dispersive X-ray (EDX). Thus, the study of catalyst during CVD process are important for a better understanding of CNM growth.

Keywords: graphitization; carbon nanomaterials; catalyst chemical vapor deposition