The 2015 World Congress on
Aeronautics, Nano, Bio, Robotics, and Energy (ANBRE15)
Incheon, Korea, August 25-28, 2015

Synthesis and characterization of carbon nanotubes to be used in the development of new ionizing radiation sensors

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ABSTRACT

Detection of ionizing radiation is crucial in different fields including energy, national security, biological and nuclear research and other applications. In general, the systems for the detection of ionizing radiation usually have one or several of the following drawbacks: incapability to produce stable signals, expensive and complicated manufacturing processes, operation at low or very low temperatures, low sensitivity or even voluminous size, as is the case of Geiger counters. Single-walled carbon nanotubes (SWNTs) are attracting much attention as promising materials for application in nano-devices due to their excellent electrical conductivity, optical, thermal and mechanical properties arising from their quasi-one-dimensional structure. One of these potential applications is the use of SWNTs as radiation sensor. For this purpose, the critical steps in the design and fabrication of devices are focused on the growth of SWNTs into controlled architectures and onto appropriate substrates. In this research we report a method for the synthesis of vertically aligned SWCNTs, based on the use of a mixture of Co and Mo salts as catalyst precursor. In this case, SWNTs are synthesized by CVD, using alcohol as carbon source. The characterization of the synthesized material has been carried out by electron microscopies (SEM and TEM), X-ray diffraction (XRD), and Raman. This material is currently being used for the design and development of new sensors for ionizing radiation.

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