Carbon nanotube fabrication inside nano-channel porous materials

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Carbon nanostructural materials have received increased attention in the last several years because they offer the promise of bulk processing of flexible, electronic devices at low cost. Among the most important carbon nanostructural systems are carbon nanotubes. The interest stems in part from the room temperature charge carrier mobility that is much higher compare to silicon, unique thermal and mechanical properties of the nanotubes, and their possible transistor applications. One of the most important current limitations to nanotube technology is an ability to control their geometrical parameters that are also determining their electronic properties. Among the techniques that have been used for these purposes is a pyrolysis of organic materials inside nanoporous substances. We have developed a new modification of this method to fabricate carbon nanotubes and other graphene related compound in the restricted geometry. Our obtained TEM images demonstrate that this new technique allows growing crystalline carbon nanotubes and nanofibers with the length least up to 10 μm that is much longer compare to other nanoporous fabrication methods. The simplicity of our method, the observed transport properties, and TEM structural results suggest that this technique can successfully be used for a device fabrication. Interpretations of the obtained experimental results and device applications including Field Effect Transistors will also be discussed.

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