

Ion track lithography and graphitic nanowires in diamondlike carbon

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Ion track lithography is well established and is based on heavy ions of several hundred MeV energy passing through a polymer film and thereby changing the material properties along the trajectory of each ion. By selective chemical track etching, small channels (down to 20–30 nm diameter) are formed which can be filled with another material or can serve as mask for further etching steps. Another application uses unetched ion tracks directly for nanostructuring. The authors' investigations showed that graphitic nanowires are formed along ion tracks in insulating diamondlike carbon films. The diameter of these conducting filaments is in the order of 8 nm. In the present article the authors describe a combination of these two possibilities to create several nanodevices such as cold field emission devices, quantum-based electronics, or interconnections in very-large-scale integrated circuits. Since the lithographic structure and the conducting filament are produced by the same ion track, the two parts of the device are self-aligned and need no further adjustment. Furthermore, it should be mentioned that the structure is created by a single ion and therefore is automatically very small in diameter and does not require special beam focusing.