1-dimensional carbon materials, such as carbon nanotubes and carbon nanofibers (CNFs), have attracted great attention in materials science and microelectronics technology. Usually they are synthesized from gas phase at elevated temperatures. In this talk, a new approach based on Ar+ ion bombardment to realize the room-temperature growth of CNFs will be introduced. Using this method, CNFs, 20-50 nm in diameter and 0.2-5 μm in length, grow without any catalyst on any substrates, even on plastics, at room temperature. Applications of the solely standing and densely distributed CNFs to CNF-based scanning probe microscope tips and flexible flat panel displays, respectively, as well as the fundamentals of this ion-induced CNF growth will be given in the talk.