**Synthesis and applications of 3D multifunctional carbon nanotube networks**

Manuela SCARSELLI - *Università degli Studi di Roma "Tor Vergata"*

The future success of smart devices based on the use of nanomaterials resides also in exploiting their physical properties, such as mechanical and electrical ones in a targeted application. In this scenario carbon nanotubes have been extensively employed in a variety of shapes and applications for decades. Recently, we synthesized bulk three-dimensional carbon networks consisting of randomly interconnected carbon nanotubes and to a less extent fibers that display a structural flexibility rarely observed in other highly porous materials. The novel material was applied as active media for water purification, as mechanical transducer, photocurrent generator and others. This paper will show that the translational potential of introducing physics rules to neural tissue repair strategies by implanting such a carbon-based scaffold material in spinal cord injury animal models. The scaffold with a necessary morphological as well as electrical characteristics once functionally integrated into spinal cord injury rats helps in healing the injured spinal cord favoring its reconstruction. The results obtained prove that the combination of nanotechnology and neurobiology might succeed in the design of hybrid microsystems.