

Strain and Frequency Improvement in Bucky Gel Actuators by Chemical Modification of Carbon Nanotubes

Maurizio Bisio^{1,2}, Alberto Ansaldo² and Davide Ricci²

¹*University of Genoa, Communication Computer and System Sciences Department
Via Opera Pia 15, 16145, Genoa - Italy*

²*Italian Institute of Technology, Robotics, Brain and Cognitive Sciences Department
Via Morego 30, 16163, Genoa - Italy*

Carbon nanotubes (CNTs) have exceptional mechanical and electrical properties that make them very attractive for actuators. When mixed with imidazolium-based ionic liquids ^[1] CNTs create a physical gel that has been used to prepare dry low voltage electrochemical actuators ^[2]. A challenge in all nanomaterial based actuators is to improve the ability to transfer efficiently phenomena occurring at the nanometer scale up to the microscale and above. Having in mind this aim, we present how using CNTs chemically functionalized with an aromatic diamine significantly improves the operating frequency and the strain of a bimorph bucky gel actuator. A comparison between pristine and chemically modified CNTs will be reported by means of SEM images, electrical conductivity measures and micro-Raman spectra. The obtained materials were used to prepare bimorph actuators; electrochemical characterizations by cyclic voltammetry, impedance spectroscopy and actuation tests at frequencies between 0.3 Hz to 20 Hz will be reported and discussed.

[1] T.Fukushima et al. *Chem.Eur.J.* **2007**, 13, 5048-5058

[2] I.Takeuchi et al. *Electrochim.Acta* **2009**, 54, 1762-1768