ELECTRON EMISSION FROM VERTICALLY ALIGNED FEW-LAYER GRAPHENE AND CARBON NANOTUBES: A COMPARATIVE STUDY

S. Bellucci[a], **A. Malesevic**[a,b*], **F. Micciulla**[a*], **I. Sacco**[a],
R. Kemps[b], **A. Vanhulsel**[b], and **C. Van Haesendonck**[c]

[a]INFN-Laboratori Nazionali di Frascati, Via E. Fermi 40, 00044 Frascati, Italy
[b]VITO Materials, Flemish Institute for Technological Research, Boeretang 200, BE-2400 Mol, Belgium
[c]Laboratory of Solid-State Physics and Magnetism, Katholieke Universiteit Leuven, Celestijnenlaan 200 D, BE-3001 Leuven, Belgium
*Present address: BrainLAB AG, Kapellenstrasse 12, Feldkirchen, D-85622, Germany

The field emission behaviour of vertically aligned few-layer graphene and carbon nanotubes is measured, making use of a parallel plate type setup. Few-layer graphene was synthesized in the absence of any metallic catalyst by microwave plasma enhanced chemical vapour deposition with gas mixtures of methane and hydrogen. The deposit consists of nanostructures that are several micrometers wide, highly crystalline stacks of four to six atomic layers of graphene, aligned vertically to the substrate surface in a high density network. The electron emission of few-layer graphene turns out to be comparable to that of carbon nanotube buckypaper, as both materials are characterized by turn-on fields as low as 2 V/μm and field amplification factors up to several thousands. In contrast, the field emission from single-walled and multi-walled carbon nanotubes shows markedly improved characteristics, with turn-on fields below 1 V/μm and field amplification factors up to several times the value for few-layer graphene.