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CVD graphene coating of Cu cables for low voltage domestic and industrial wiring

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Copper is commonly employed in industrial wiring applications, owing to its excellent thermal, electrical and mechanical properties. However, Cu wires are easily oxidized when exposed to air [1] and conventional anticorrosion coatings have several issues, such as affecting the dimension, and the properties of the underlying material. Thereby, research efforts are devoted to develop effective and lightweight coatings to successfully prevent oxidation of Cu wires and possibly increase the electrical conductivity of the material with the aim of saving production costs. Graphene grown via chemical vapor deposition (CVD) is an interesting candidate material for ultrathin coating of Cu wires thanks to its extraordinarily high thermal and electrical conductivity, strength and adhesion to the original morphology of the surface [2-4]. We report the successful CVD growth of graphene on commercial Cu wires by controlling and optimizing sensitive growth parameters, and the morphological, spectroscopic, and electrical characterization of the samples as prepared and after natural aging. Our results demonstrate that graphene can effectively enhance the electrical properties of Cu cables, leading to 0.7-2.0% improvement in conductivity, with respect to pristine Cu wires, after 1 year. This process, carried out in safe conditions and using short times, paves the way for the development of an innovative reactor to enable in-line coating at industrial scale.

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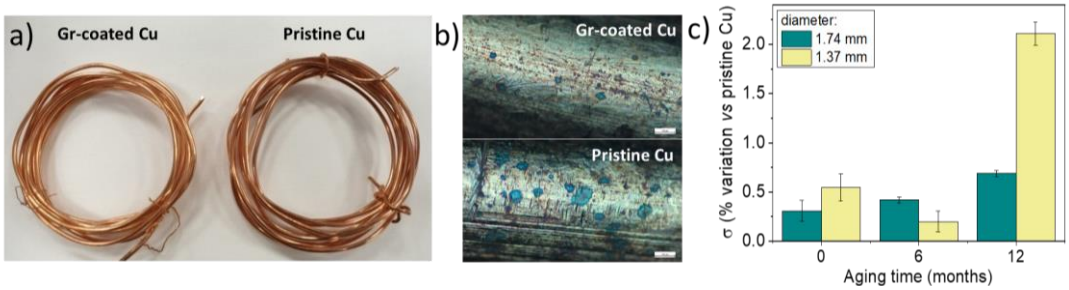

Figure 1: Appearance (a) and optical images (b) of pristine and Gr-coated Cu wires. Conductivity improvement of Gr-coated Cu wires through aging (c).

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