High performance diamond-like carbon layers obtained by pulsed laser deposition for conductive electrode applications

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Abstract: For the future, one of the biggest challenge faced to the technologies of flat panel display and various optoelectronic and photovoltaic devices is to find an alternative to the use of transparent conducting oxides like ITO. In this new approach, the objective is to grow high conductive thin-layer graphene (TLG) on the top of diamond-

like carbon (DLC) layers presenting high performance. DLC prepared by pulsed laser deposition (PLD) have attracted special interest due to a unique combination of their properties, close to those of monocrystalline diamond, like its transparency, hardness and chemical inertia, very low roughness, hydrogen-free and thus high thermal stability up to 1000 K. In our future work, we plane to explore the synthesis of conductive TLG on top of insulating DLC thin films. The feasibility and obtained performances of the multi-layered structure will be explored in great details in the short future to develop an alternative to ITO with comparable performance (conductivity of transparency). To select the best DLC candidate for this purpose, we focus this work on the physicochemical properties of the DLC thin films deposited by PLD from a pure graphite target at two wavelengths (193 and 248 nm) at various laser fluences. A surface graphenization process, as well as the required efficiency of the complete structure (TLG/DLC) will clearly be related to the DLC properties, especially to the initial sp^3/sp^2 hybridization ratio. Thus, an exhaustive description of the physicochemical properties of the DLC layers is a fundamental step in the research of comparable performance to ITO.

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