Nanocrystalline Boron-doped Diamond: Spectro / Photo / Electrochemical Properties and Prospective Applications in Solar Cells

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Nanocrystalline boron doped diamond films were grown by a microwave plasma enhanced chemical vapor deposition and surface-terminated either by hydrogen or oxygen.[1] Electrochemical impedance spectroscopy in aqueous electrolyte solution provided the flatband potentials and concentrations of acceptors, which relate to the B-concentrations obtained from the neutron depth profiling. Electrochemical cleaning of the surface from sp^2 carbon impurities was demonstrated by Raman spectroscopy.[2] In-situ Raman spectroelectrochemistry shows that Raman response of sp^3 carbon is intact to electrochemical charging, whereas the D, G and D' Raman modes of the sp^2 carbon impurities are not. The quality of nanocrystalline diamond electrodes can be thus analyzed in detail. Spectral sensitization of the nanodiamond surface was carried out by anchoring of dyes like 4-(bis-{4-[5-(2,2-dicyano-vinyl)-thiophene-2-yl]-phenyl}-amino)-benzoic acid (P1 from Dyenamo AB). The target device is a nanodiamond-based p-type dye-sensitized solar cell, which is an alternative of the well known n-type dye-sensitized soalr cell based on titania photoanode.

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References

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