INVESTIGATION OF PHOTOVOLTAIC AND OPTICAL PROPERTIES OF SELF-ORGANIZED ORGANIC-INORGANIC HYBRIDS USING AROMATIC DRUGS AND PATTERNED SILICON

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S u m m a r y

The effect of incorporation of the functional groups of aromatic moleculas onto the Si surface has been investigated by photovoltaic (PV) and photoluminescence (PL) characteristics, infrared (IR) spectroscopy, scanning electron microscopy (SEM), and optical microscopy (OM). To realize the organic-inorganic hybrids, the thin (10–100 nm) layers of heteroatom aromatic pharmaceutical drugs (APD) such as clonidine hydrochloride (CLON), procainamide hydrochloride (PRO), and cyanocobalamin (CYCAM – B_{12} vitamin) were formed by the chemical solution deposition process on the Si patterned surface at room temperature under laboratory ambient conditions. The hybrids have shown: (i) the solar energy conversation with an efficiency up to 6–7% in dependence on the chemical solution media and the surface and interface morphologies; (ii) the highest efficiency of 8.4% in CLON–Si hybrids produced in a mixed solution with a layer 30 nm in thickness and a self-organized net-like surface morphology; (iii) the intense photoluminescence in the waverange of 400–900 nm, luminescence profile, and peak position suggest the vibronic origin of this band; (iv) the presence of characteristic bands associated to the functional groups containing nitrogen (amines NH_x (x = 0, 1, 2), amides OCN, cyanonitrile CN), carbon and/or hydrogen-hydrocarbons (CH_x ($x = 1, 2, 3$)), oxygen (hydroxyl *OH*, peptide CO), halogene (chloroalkane) and phosphorus (phosphate $OPO(OH)_2$). Possible principles of operation of APD–Si hybrids are discussed.