Solar cells will be fabricated by a single organic semiconductor

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The fabrication of organic thin-film solar cells has been simplified due to new research findings. Where previously two types of organic semiconductors were required, doping the semiconductor fullerene with molybdenum oxide renders the use of phthalocyanine unneccessary.

The Institute for Molecular Science, National Institute of Natural Sciences announced on March 3, 2011 that a research group led by Professor Masahiro Hiramoto has succeeded in converting conduction-type of fullerene from n- to p-type by molybdenum oxide (MoO_3) doping. Details are published online in *Applied Physics Letters* on February 28, 2011.

Although organic thin-film solar cells are promising devices because of the advantages of being light weight, flexible and low cost, the conduction-type of organic semiconductors has not been controlled by doping impurities as is done in silicon. Two species of organic semiconductors, n-type fullerene (C_{60}) and p-type phthalocyanine (Pc), need to be used to form built-in fields in solar cells.

Researchers noticed that MoO_3 is used to raise holes in organic electroluminescent materials. They have succeeded in converting conduction-type of C60 from n- to p-type by co-evaporation of MoO_3 and C_{60}. Energetic value of the Fermi level, 4.60eV, for nondoped C_{60} films measured by the Kelvin vibrating capacitor method was positively shifted to 5.88 eV by the co-evaporated doping of MoO3 at a concentration of 3300 ppm and approached the valence band of located

at 6.4 eV. The upward bending of energy band in the Schottky junction formed at the interface between a metal (silver, Ag) and p-type C_{60} film formed by MoO_3 doping was confirmed based on the photovoltaic properties. Organic solar cells could be fabricated by a single material - fullerene C_{60}.

More information: Masayuki Kubo, et al. "Conduction-type control of fullerene films from n- to p-type by molybdenum oxide doping", *Applied Physics Letters* Vol.98, No. 7, p. 073311 (2011); doi:10.1063/1.3556312 (3 pages); published online 18 February 2011.

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