Synchrotron-radiation photoemission study of electronic structures of a Cs-doped rubrene surface

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Using synchrotron-radiation photoemission spectroscopy, we have studied the electronic structure of a Cs-doped rubrene surface. The doping induces the energy level shift and molecular orbital change at different doping level that can be separated into four different stages. In the first stage, the Cs atoms continuously diffuse into the substrate, and the Fermi level moves in the energy gap as a result of the doping of electrons from the Cs to the rubrene. The second stage, in which the shifts of the spectra are interrupted, is characterized by the introduction of two gap states. As increasing doping of Cs into the third stage, the spectra move again. In the fourth stage, the movement of the spectra almost stops and the third gap state appears in the former forbidden region. A pronounced shift of the vacuum level was observed, indicating the formation of an interfacial dipole.

Evolution of valence-band spectra recorded for Cs doping into rubrene.