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Ultrafast Charge-Transfer at an Organic Semiconductor / Oxide Interface¹ OLIVER MONTI, DAVID RACKE, LEAH KELLY, University of Arizona, PHILIP SCHULZ, Princeton University, DENNIS NORDLUND, SLAC National Accelerator Laboratory — We use photoemission to investigate with complete element specificity the electronic structure and carrier dynamics at a model organic semiconductor / transparent conductive oxide interface. For the prototypical interface of C₆₀ on highly conductive thin ZnO we show that hybrid interface states form in both the ground and excited state manifold. Using resonant photoemission spectroscopy, we are able to observe ultrafast carrier delocalization in bare ZnO, with electrons scattering into bulk states on the time-scale of less than 2 fs. In the presence of C₆₀, hybridization between molecule and oxide and the resulting interface state formation lead to carrier localization and long-lived excited states in the vicinity of the conduction band minimum. Our results demonstrate for the first time the importance of hybrid interface states for carrier dynamics at organic / inorganic heterojunctions.

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