# Ultrafast carrier dynamics of perovskites on mesoporous $TiO_2$ scaffolds in contact with hole transport materials

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Hybrid perovskites, *e.g.* methylammonium lead iodide (MAPI), are promising materials for solar light harvesting and optoelectronics. The improvement of their electronic properties requires an understanding of the charge carrier dynamics, such as carrier recombination and cooling as well as the role of the perovskite's stoichiometry on these properties.[1,2] The large surface area especially in mesoporous architectures calls for a careful characterization of the carrier injection processes across the different interfaces, particularly the hole transfer from the perovskite into the hole transport material (HTM) and electron injection from the perovskite into mesoporous $TiO_2$ (mp-$TiO_2$). We present results for three-layer arrangements (mp-$TiO_2$ / perovskite / HTM) obtained by ultrafast broadband transient absorption spectroscopy (260-1600 nm), where spectral signatures of the perovskite, HTM radical cations and $TiO_2$ conduction band electrons are observed. We will establish time scales and efficiencies of hole transfer from the perovskite into different triarylamine-based HTMs, such as H101 (Fig. 1). Relative contributions of electron transport inside the perovskite and $TiO_2$ will be also quantified.

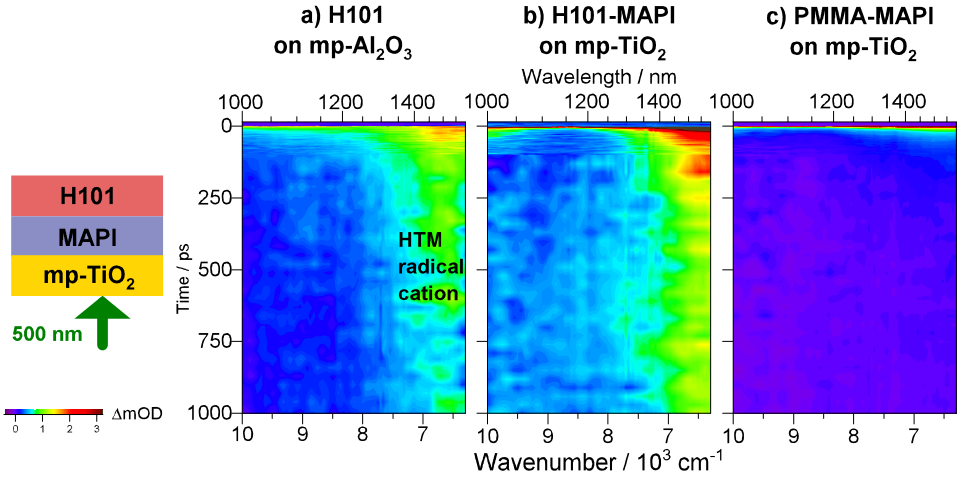


Figure 1. Comparison of transient NIR absorption contour plots showing the formation of HTM radical cations on mp-$Al_2O_3$ and MAPI. The PMMA-MAPI sample is shown as a reference system.

## References:

[1] J. R. Klein, O. Flender, M. Scholz, K. Oum, T. Lenzer, *PCCP*, **2016**, 18, 10800

[2] O. Flender, J. R. Klein, T. Lenzer, K. Oum, *PCCP*, **2015**, 17, 19238