

Supporting Information (SI)

A New Strategy for Monitoring the Charge Transfer from Perovskite Thin Film to Electron Transport Layer using Heterodyne Transient Grating Technique

*Young Hyun Kim and Woon Yong Sohn**

Department of Chemistry, Chungbuk National University, Chungdae-ro 1, Cheongju, Chungbuk
28644, Korea

***Corresponding Author**

W. Y. Sohn, Phone: 82-43-261-2285, E-mail: nunyong@chungbuk.ac.kr

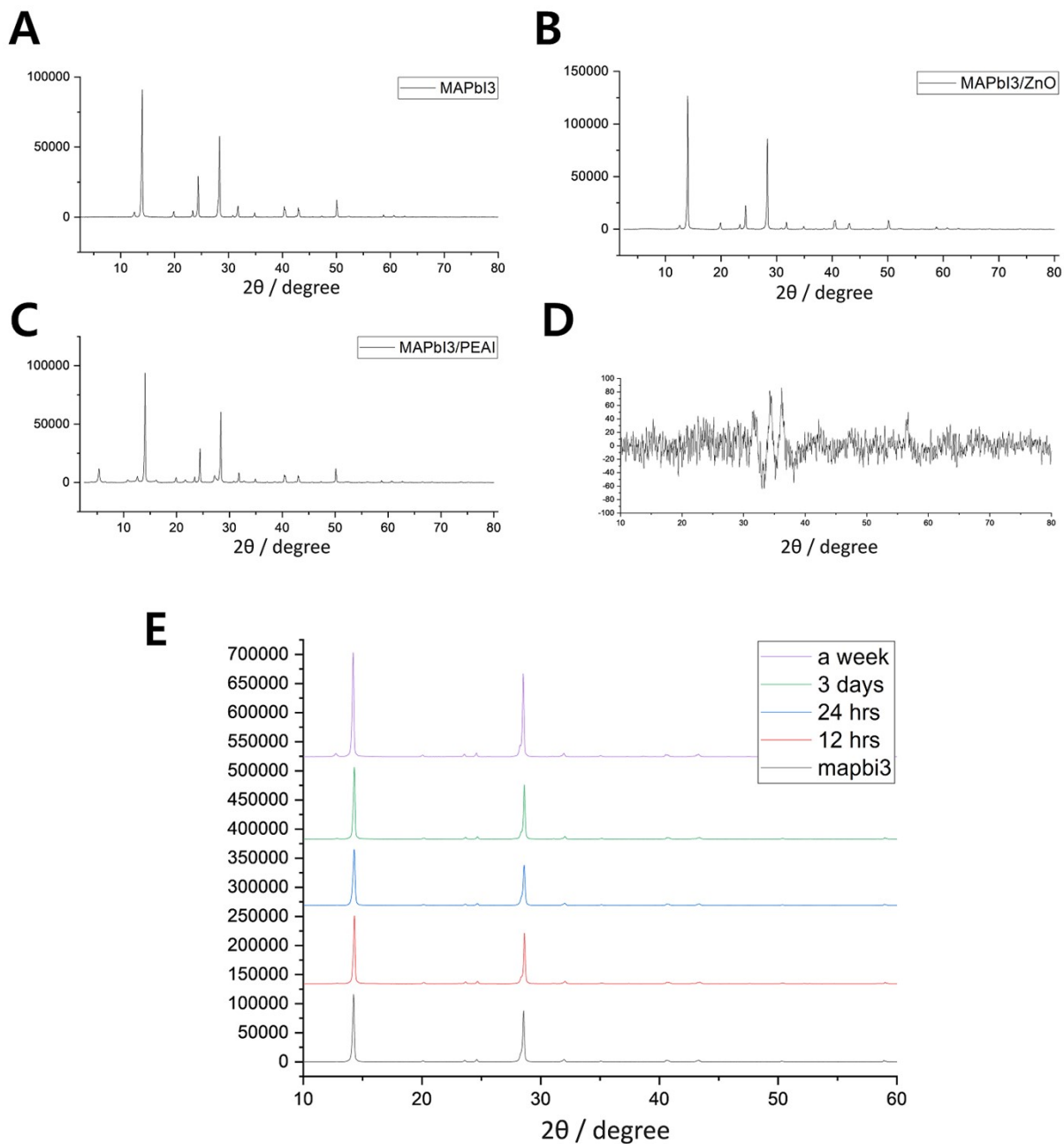


Figure S1 X-ray diffraction (XRD) patterns of A) MAPbI₃, B) MAPbI₃/ZnO and C) MAPbI₃/PEAI. D) XRD pattern of ZnO of which film was spin-coated for five times. E) XRD patterns of MAPbI₃ as a function of time

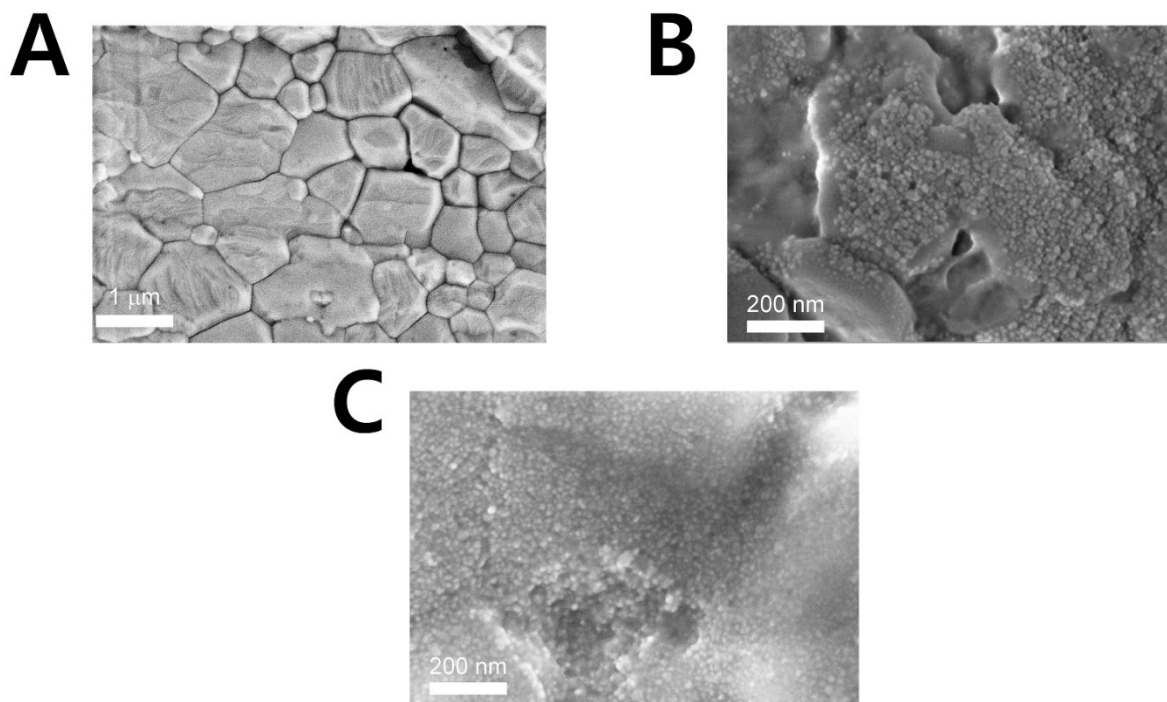


Figure S2 Scanning electron microscopy (SEM) images of A) MAPbI₃, B) MAPbI₃/ZnO and C) MAPbI₃/PEAI/ZnO

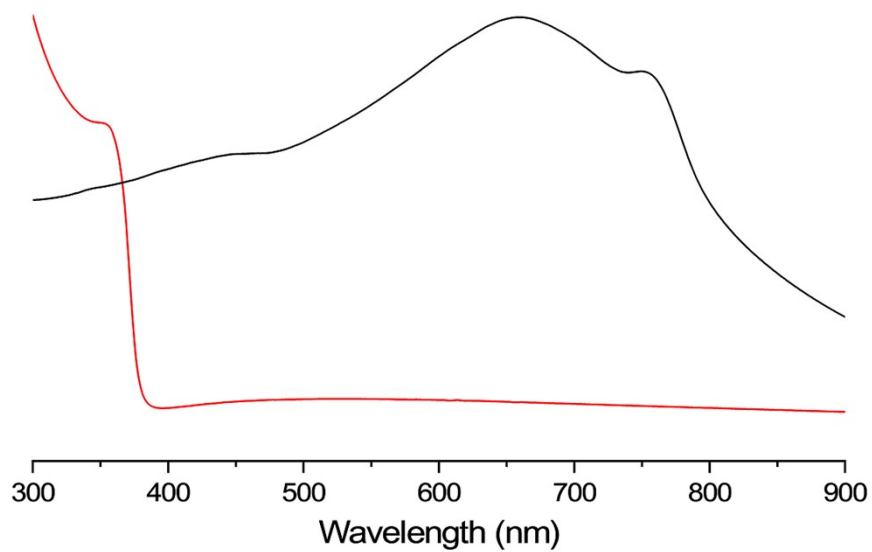


Figure S3 UV-Vis spectra of MAPbI₃ (black) and ZnO (red)

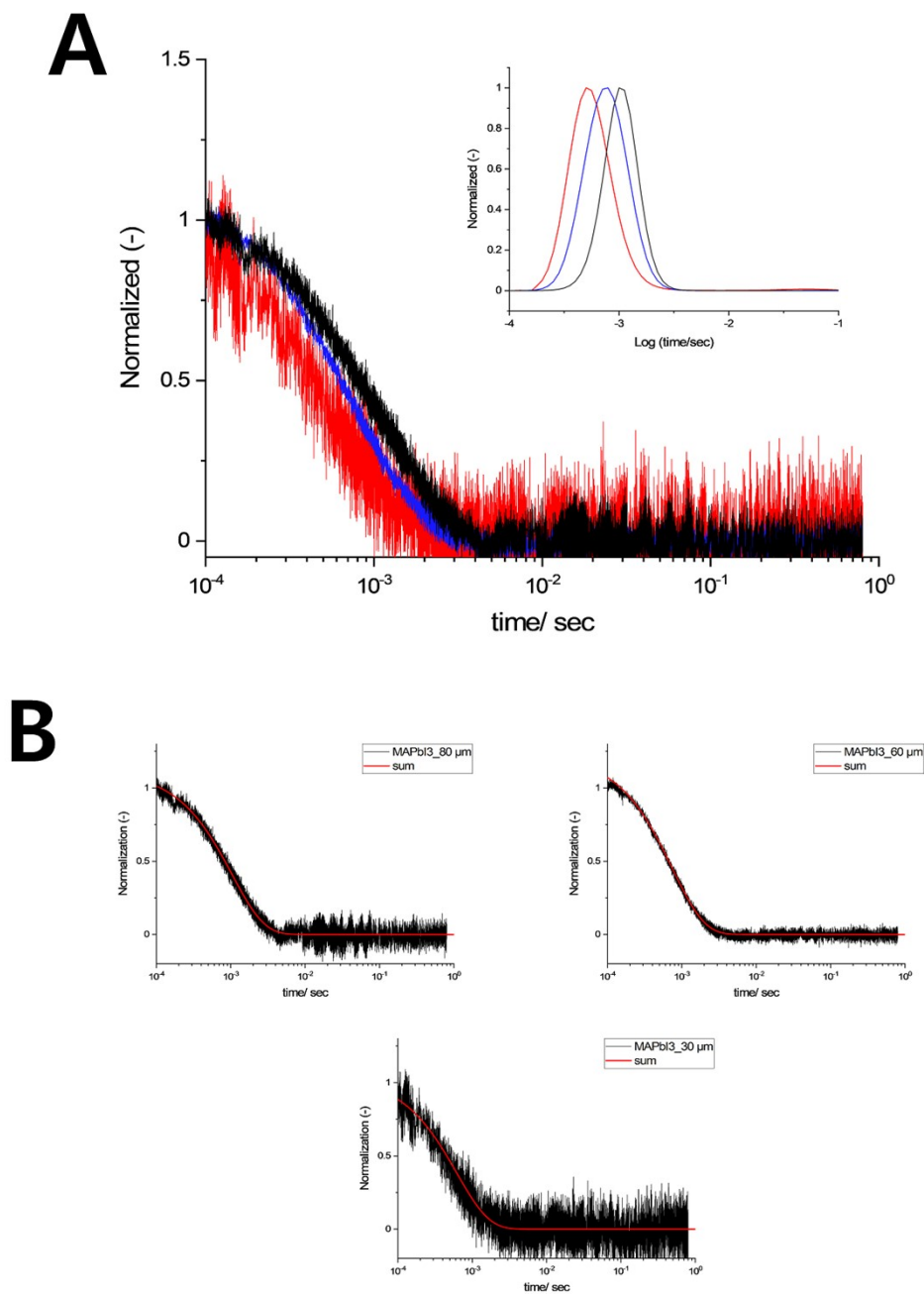


Figure S4 A) HD-TG responses of MAPbI₃ in Toluene with the grating spacings (Λ) of 30 μm (red), 60 μm (blue) and 80 μm (black) under the pumping energy of 1 mJ, probed by 660 nm light, and B) fitting curves for each response. The time constant distributions obtained by the MEM analysis is presented in the inset of the figure A.

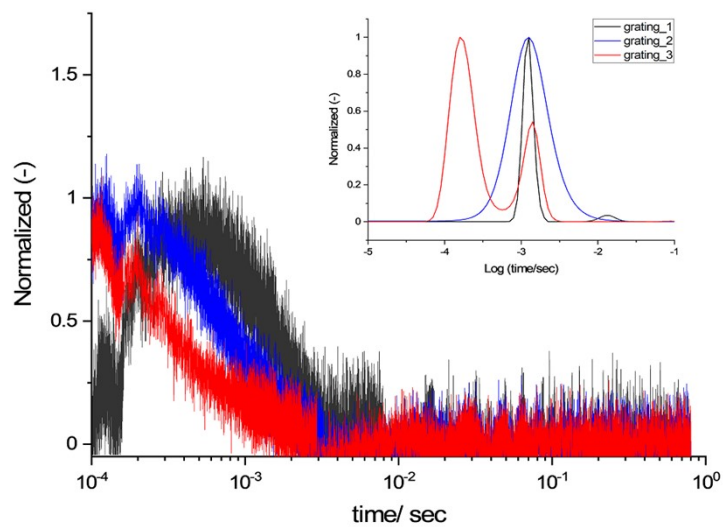
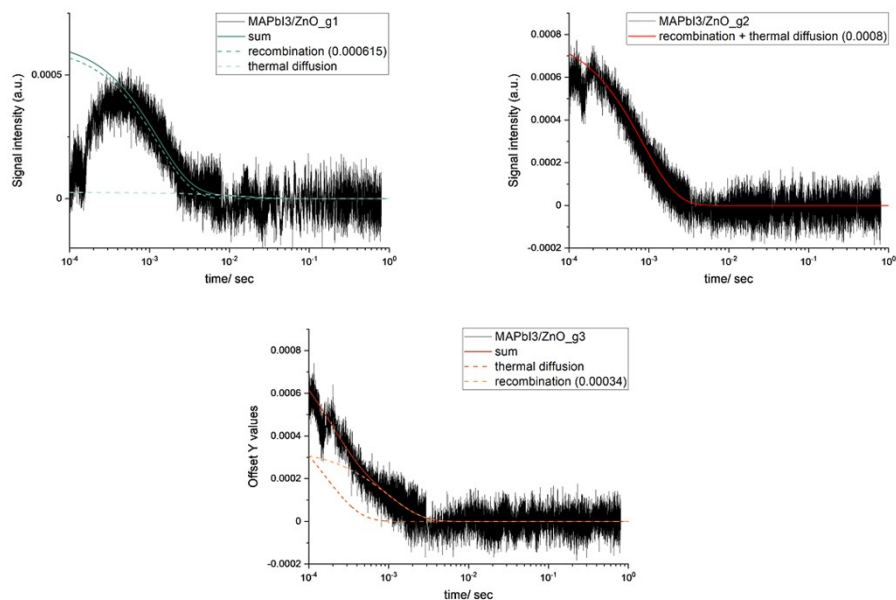
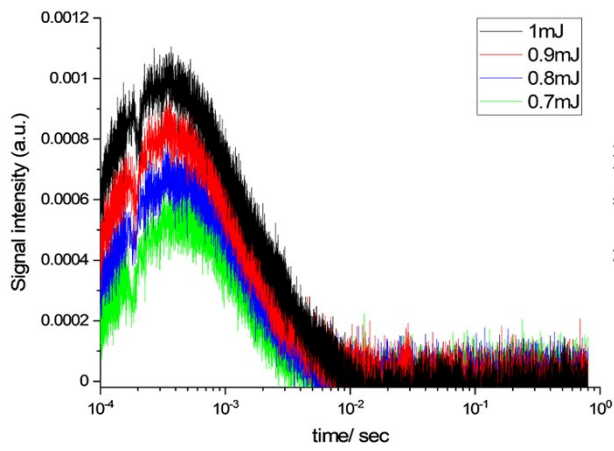
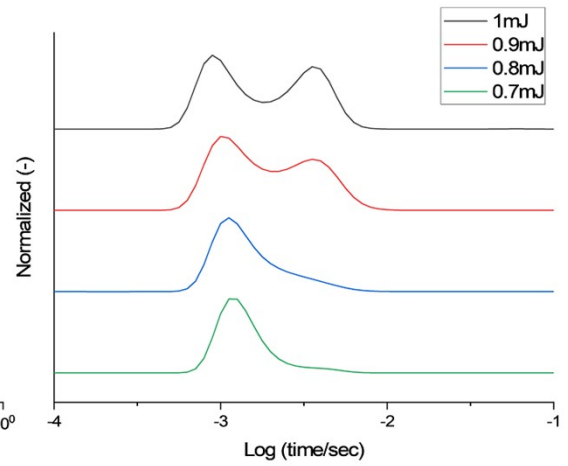
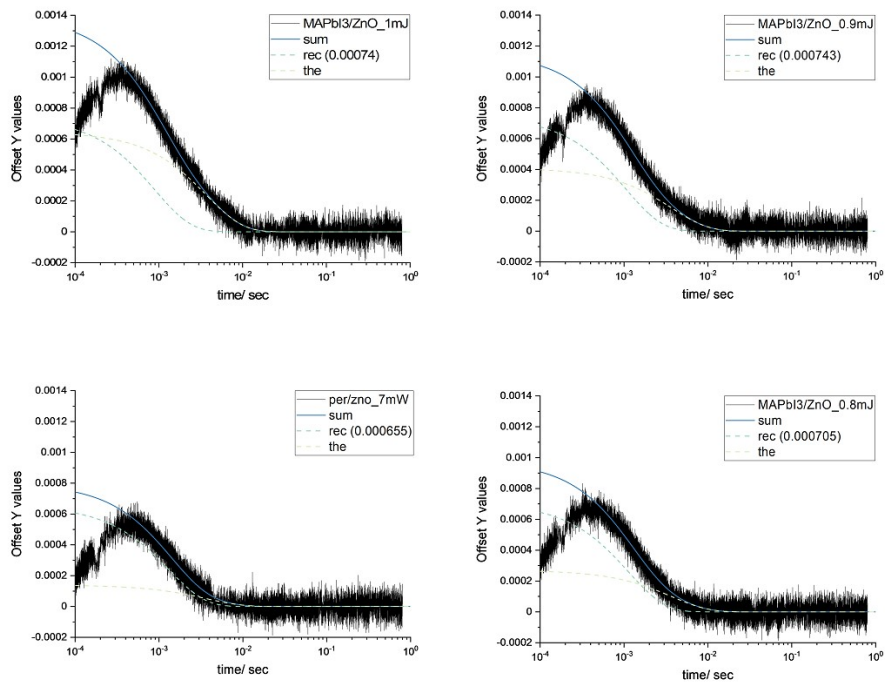
A**B**

Figure S5 A) HD-TG responses of MAPbI₃/ZnO in Toluene with the grating spacings (Λ) of 30 μm (red), 60 μm (blue) and 80 μm (black) under the pumping energy of 0.9 mJ, probed by 660 nm light, and B) fitting curves for each response. The time constant distributions obtained by the MEM analysis is presented in the inset of the figure A.

A**B****C**

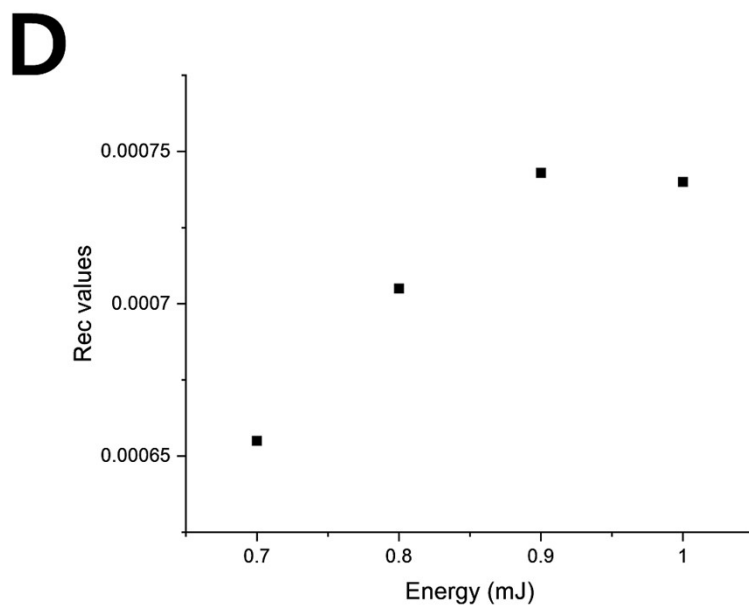


Figure S6 A) HD-TG responses of MAPbI₃/ZnO in Toluene, depending on the pump laser intensities of 0.7 mJ (green), 0.8 mJ (blue), 0.9 mJ (red) and 1.0 mJ, probed by 660 nm light. B) The time constant distributions obtained by the MEM analysis. C) Fitting curves for each response in the figure A. D) The amplitudes of the unknown component were plotted as a function of the pump light intensities.

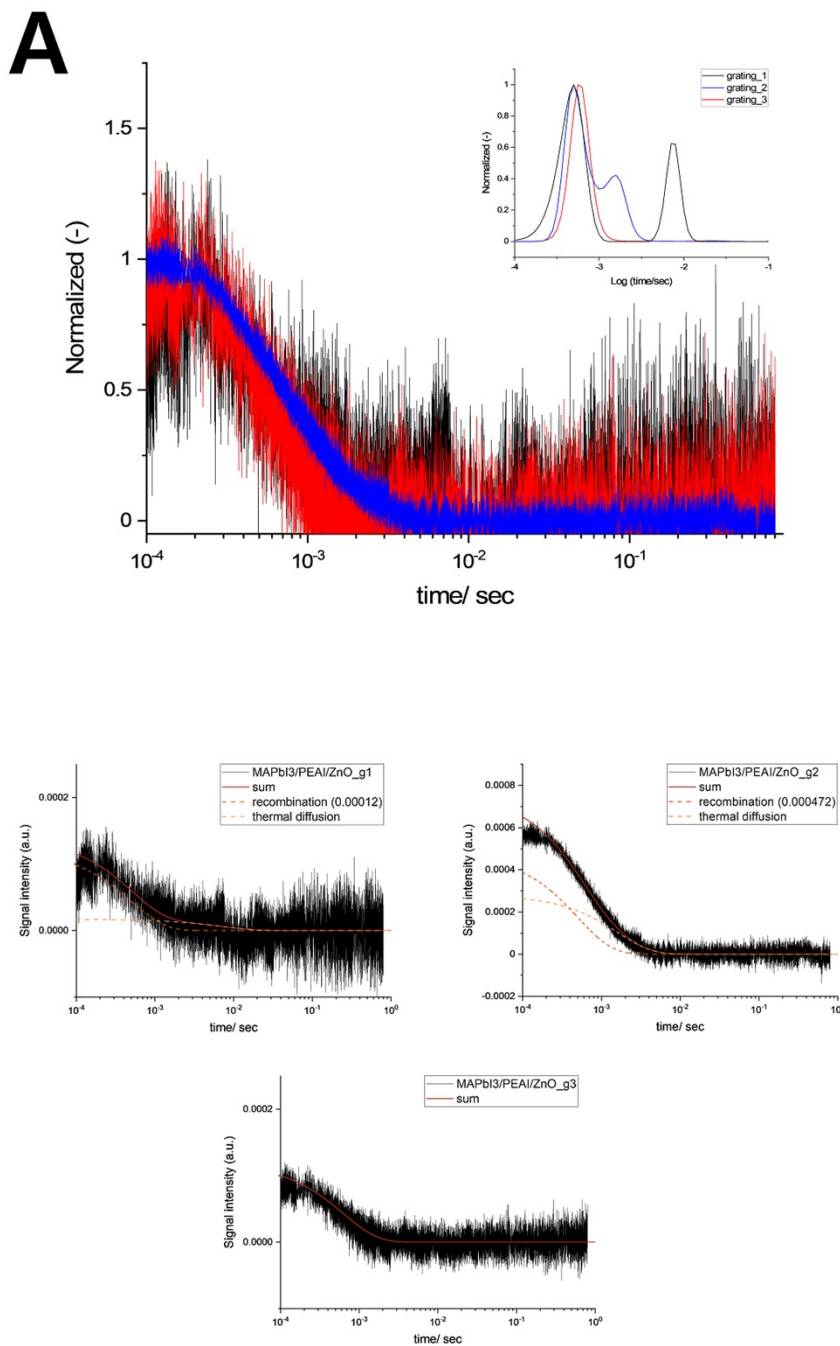


Figure S7 A) HD-TG responses of MAPbI₃/PEAI/ZnO in Toluene with the grating spacings (A) of 30 μm (red), 60 μm (blue) and 80 μm (black) under the pumping energy of 0.75 mJ, probed by 660 nm light, and B) fitting curves for each response. The time constant distributions obtained by the MEM analysis is presented in the inset of the figure A.