Supplementary Information

Giant photoresponse in quantized $SrRuO_3$ monolayer at oxide interfaces

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Supplementary Figures. S1-S2

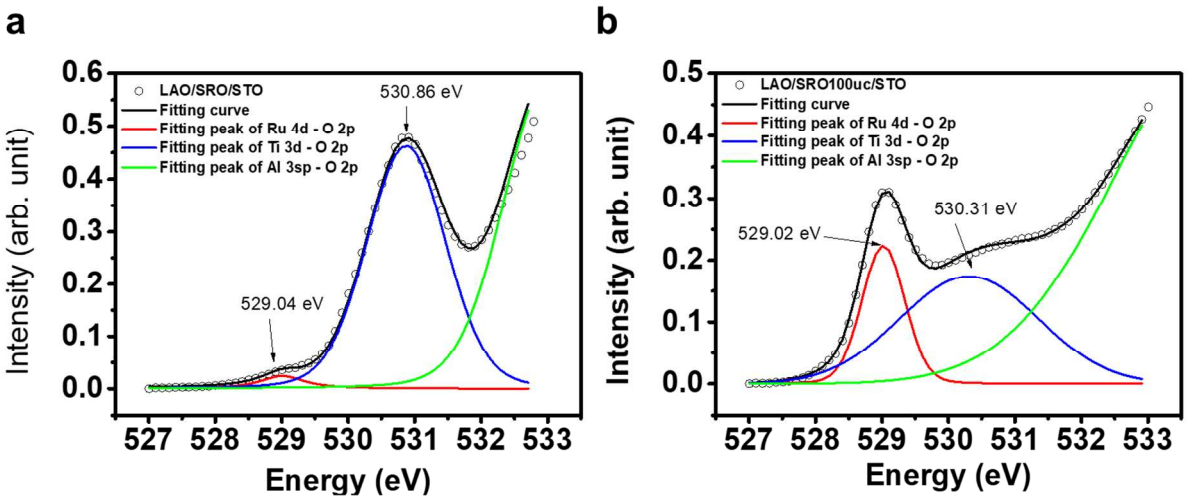

Figure S1. The fitting results of Ru *4d* – O *2p* and Ti *3d* – O *2p* hybridizations for both the (a) SRO monolayer and (b) bulk SRO thin film heterostructures across the XAS spectra of O *K* edge. The nearly the same peak positions of these hybridizations suggest no oxygen deficiency occurring at the RuO_2 plane in the SRO monolayer and the neighboring TiO_2 planes inside the substrate.

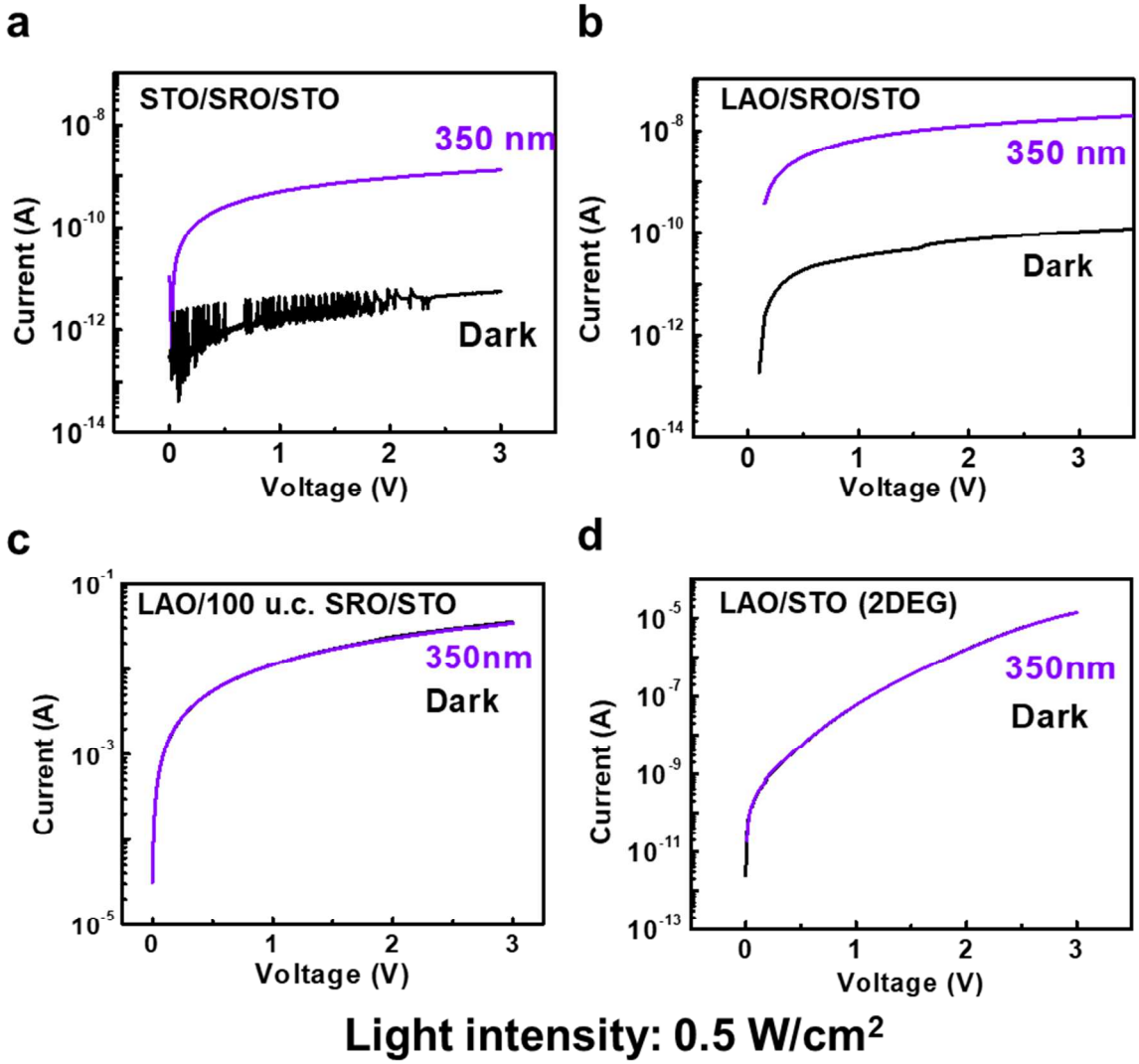

Figure S2. The I-V curves for (a) STO/SRO/STO, (b) LAO/SRO/STO, (c) LAO/100 u.c. SRO/STO, (d) LAO/STO (2DEG). Both (a) and (b) are constructed by the semiconducting SRO monolayer, which can show a large increment of current under ultraviolet light illumination with the power density of 0.5 mW/cm^2. Both (c) and (d) are the control group that are highly conductive at interface between capping layer and STO substrate, which have no obvious photocurrent under the same illumination environment. Such the comparison indicates that a large photoresponse can be indeed originated by the SRO monolayer inserted at the interface of the oxide heterostructures.