Journal Name

ARTICLE TYPE

Cite this: DOI: 10.1039/xxxxxxxxxx

Electronic Supplementary Information: Ultrafast Charge Transfer and Carrier Dynamics in a $WS_2/MoSe_2$ Few-Layer van der Waals Heterostructure

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Received Date
Accepted Date

DOI: 10.1039/xxxxxxxxxx

www.rsc.org/journalname

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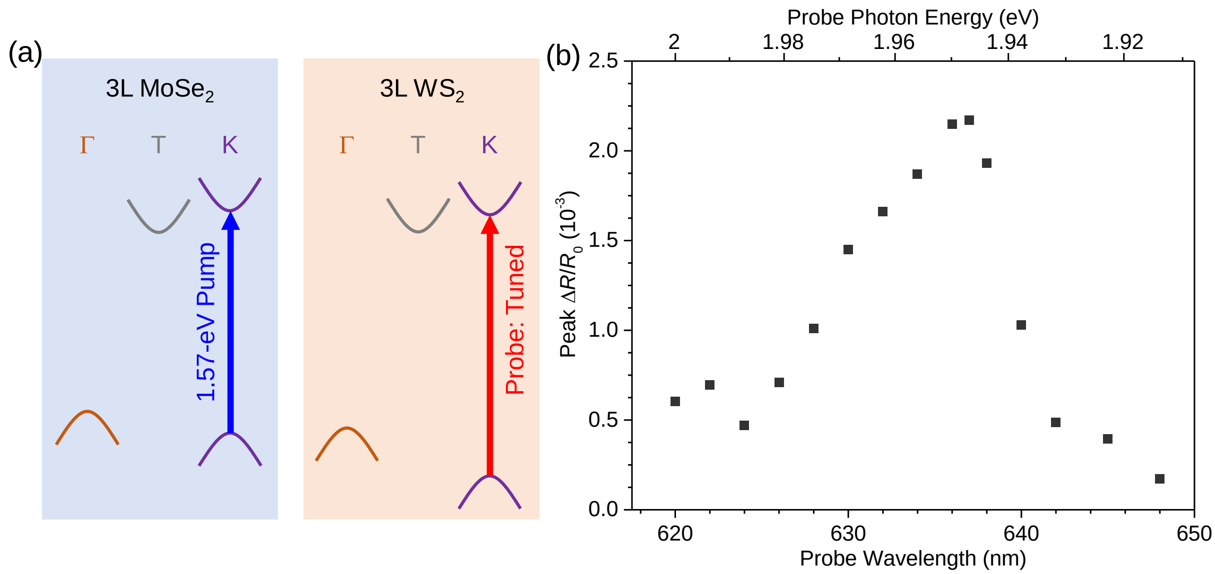

Fig. ESI1 (a) Experimental configuration to study probe-wavelength dependence of the differential reflectance signal of the 3L-WS_2/3L-$MoSe_2$ heterostruc-ture. (b) Peak differential reflectance as a function of the probe wavelength with a 1.57-eV pump. The peak signal for each wavelength is obtained by choosing the probe delay that produces the maximal signal.

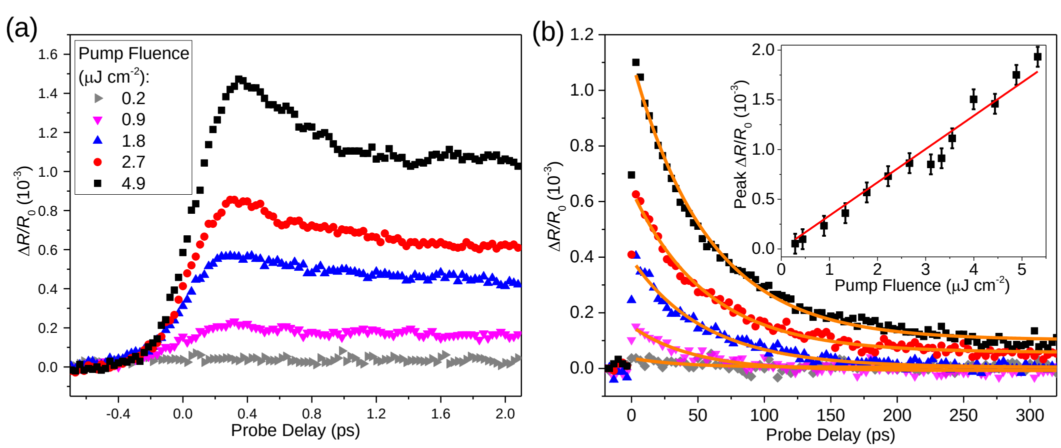

Fig. ESI2 Differential reflectance of a 1.95-eV probe pulse measured from the 3L-WS_2/3L-$MoSe_2$ heterostructure with a 1.57-eV pump pulse of various fluences as labeled. (a) and (b) show the signal on short- and long-time ranges, respectively. The orange curves are bi-exponential fits (see main text). The inset of (b) shows the linear relation between the peak signal and the pump fluence, which is obtained by choosing the probe delay that produces the maximal signal.

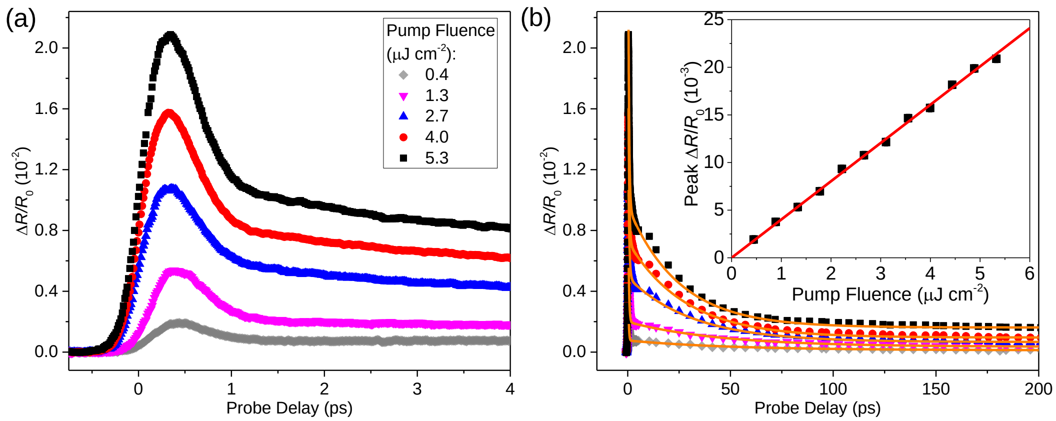

Fig. ESI3 Differential reflectance of a 1.95-eV probe pulse measured from the 3L-WS_2/3L-$MoSe_2$ heterostructure with a 3.02-eV pump pulse of various fluences as labeled. (a) and (b) show the signal on short- and long-time ranges, respectively. The orange curves are bi-exponential fits (see main text). The inset of (b) shows the linear relation between the peak signal and the pump fluence, which is obtained by choosing the probe delay that produces the maximal signal.

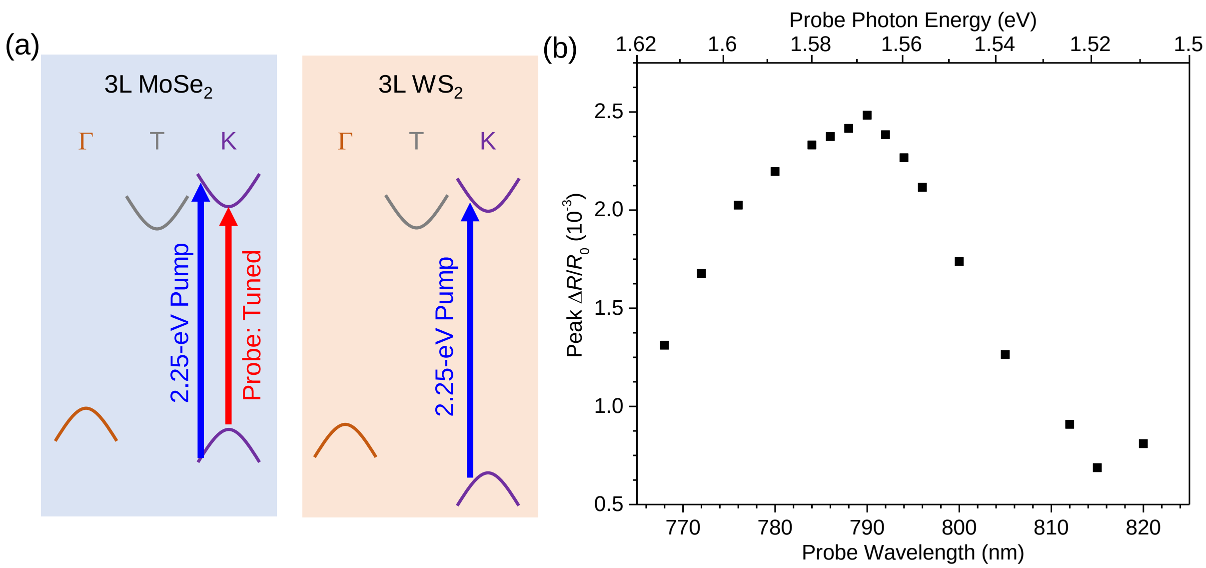

Fig. ESI4 (a) Experimental configuration to study probe-wavelength dependence of the differential reflectance signal of the 3L-WS_2/3L-$MoSe_2$ heterostruc-ture. (b) Peak differential reflectance as a function of the probe wavelength with a 2.25-eV pump. The peak signal for each wavelength is obtained by choosing the probe delay that produces the maximal signal.

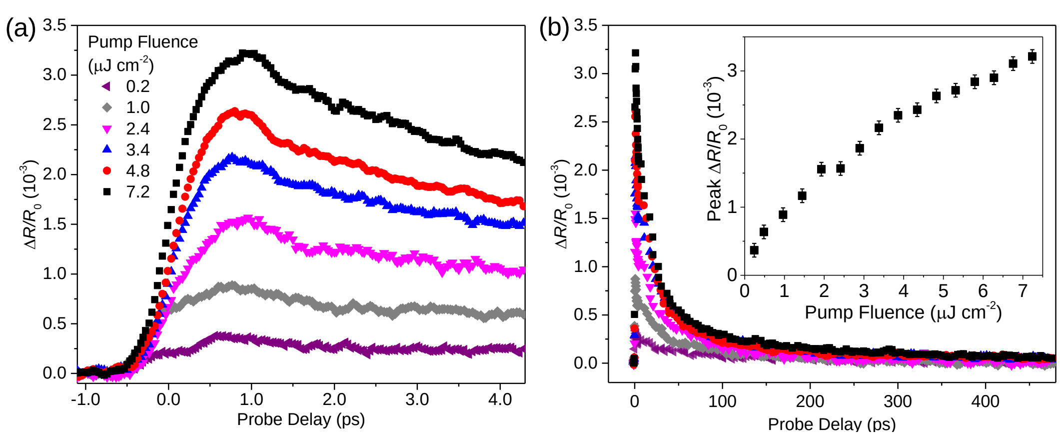

Fig. ESI5 Differential reflectance of a 1.57-eV probe pulse measured from the 3L-WS_2/3L-$MoSe_2$ heterostructure with a 2.25-eV pump pulse of various fluences as labeled. (a) and (b) show the signal on short- and long-time ranges, respectively. The inset of (b) shows the linear relation between the peak signal and the pump fluence, which is obtained by choosing the probe delay that produces the maximal signal.