



## Supporting Information

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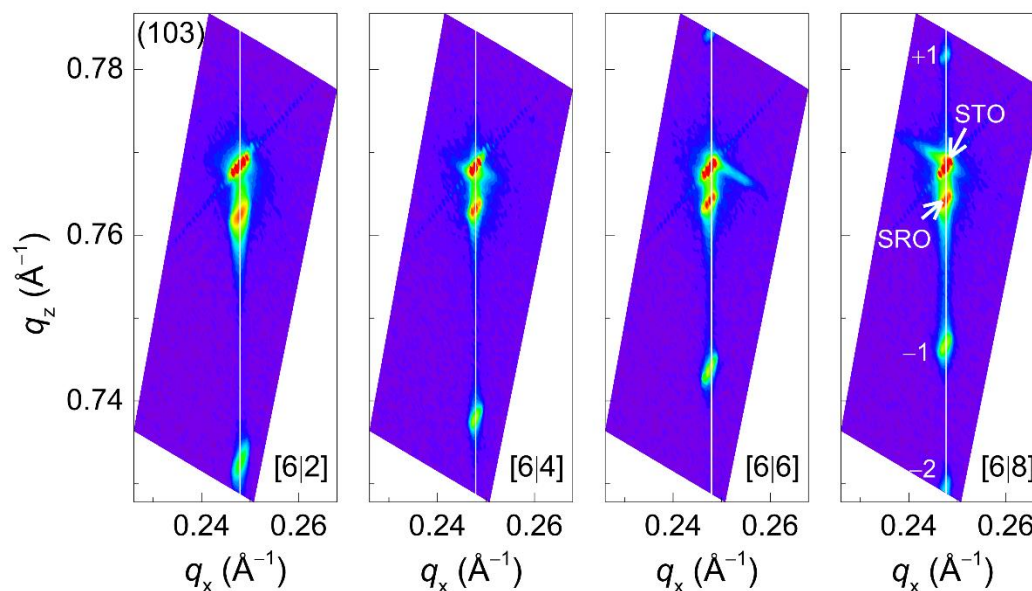
Atomistic Engineering of Phonons in Functional Oxide  
Heterostructures

*Seung Gyo Jeong, Ambrose Seo, and Woo Seok Choi\**

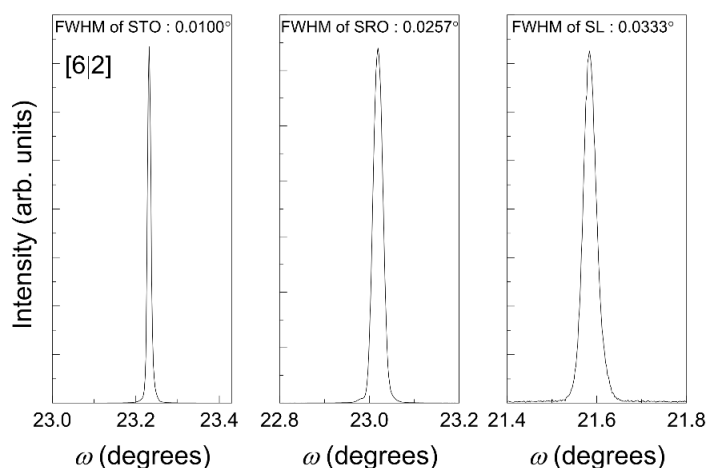
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## Atomistic Engineering of Phonons in Functional Oxide Heterostructures

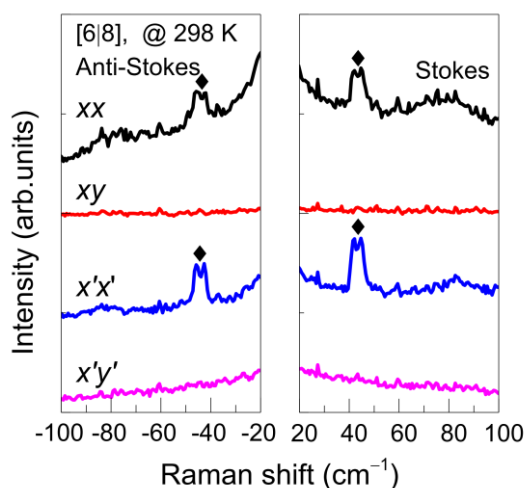
Seung Gyo Jeong, Ambrose Seo, and Woo Seok Choi\*



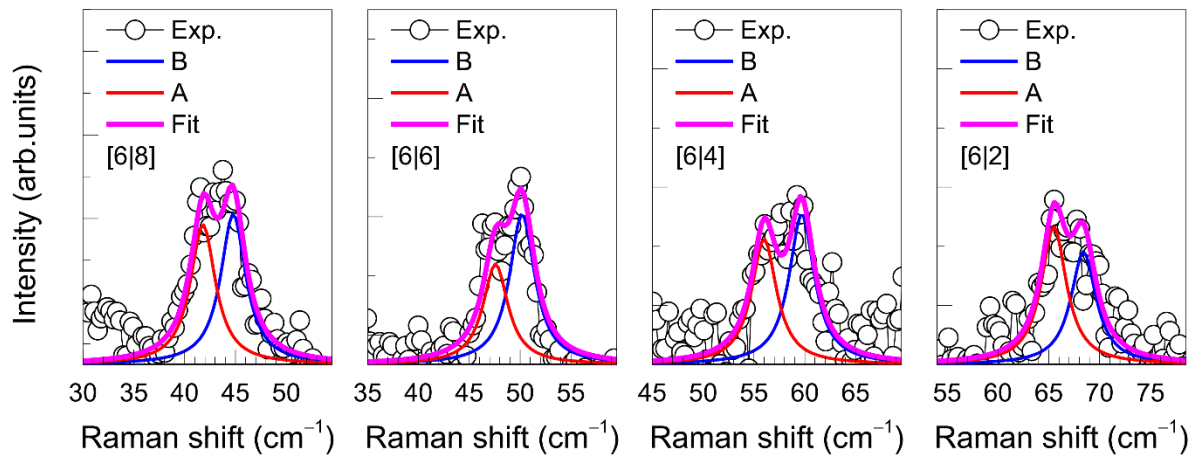
**Figure S1.** XRD RSMs of the SRO/STO superlattices. RSMs of the  $[6|y]$  superlattices with different  $y$  were measured around the STO (103) Bragg reflection. The Bragg peaks of the superlattices ( $\pm n$ ) correspond to atomically-well defined periodicities of superlattices. The vertical lines indicate a fully strained state of superlattices.



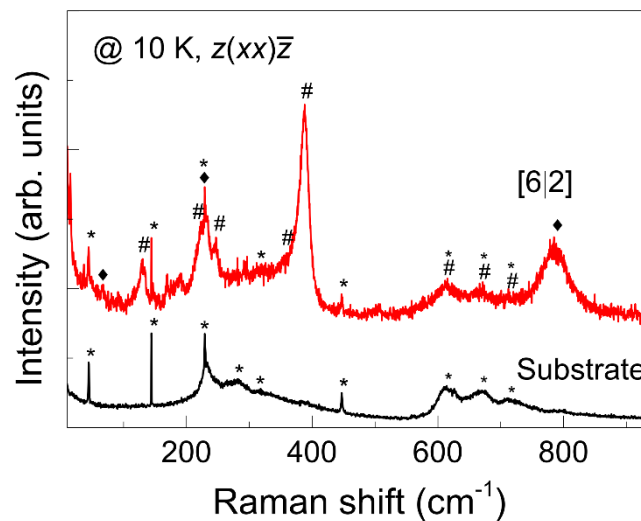
**Figure S2.** XRD rocking curve measurements of the SRO/STO superlattice. Rocking curve measurements of [6|8] superlattice were recorded around (002) Bragg reflection of each layer. The full-width-at-half-maximum (FWHM) value of SRO and superlattice peaks are comparable to that of the STO substrate. This result shows the excellent crystallinity of our oxide superlattices.



**Figure S3.** Polarization-dependent Raman spectra of the SRO/STO superlattices. Polarized Raman spectra of [6|8] superlattices were measured at room temperature. Diamonds (♦) indicate the zone-folded acoustic phonons. Both Stoke and anti-Stoke scattering assure the existence of zone-folded acoustic phonon mode in the superlattice. Polarization dependence of the phonon is consistent with previous longitudinal zone-folded phonon.<sup>[12]</sup>



**Figure S4.** Lorentzian fitting for zone-folded acoustic phonon modes. The y-dependent doublet of folded acoustic phonon  $\omega_{\text{SLS}}$  of  $[6|y]$  superlattices were obtained by Lorentzian fitting using two peaks.



**Figure S5.** Raman spectra of the SRO/STO superlattice and STO substrate, measured at 10 K. The asterisk (\*), hash (#), and diamond (♦) symbols indicate the phonon assignments for STO, SRO layers, and superlattices, respectively.