

## Supplementary information

### Phonon, plasmon and electronic properties of surfaces and interfaces of periodic W/Si and Si/W multilayers

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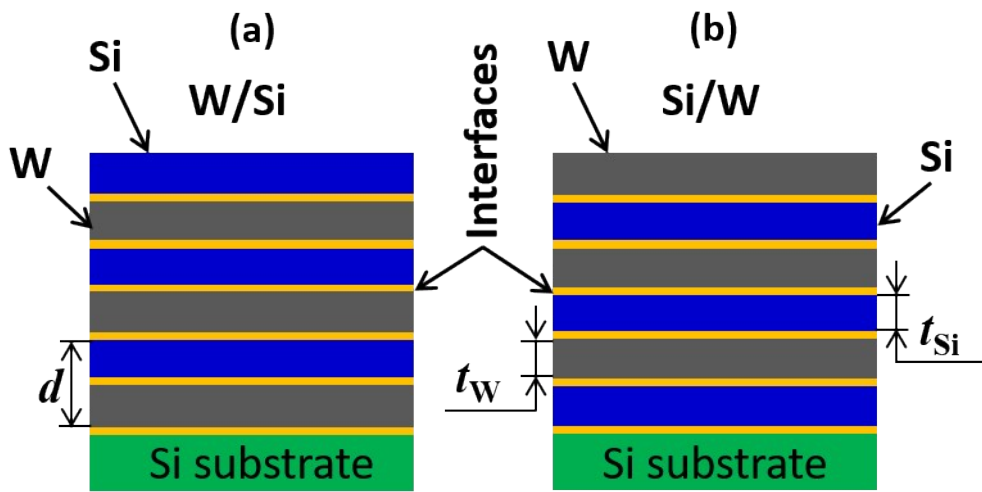


Fig. S1. Schematic representation showing top layers of Si and W in (a) W/Si and (b) Si/W multilayer structures, respectively, deposited over the monocrystalline Si (100) substrates; where  $t_{Si}$ ,  $t_W$  and  $d$  – are thickness of Si, W and period, respectively.

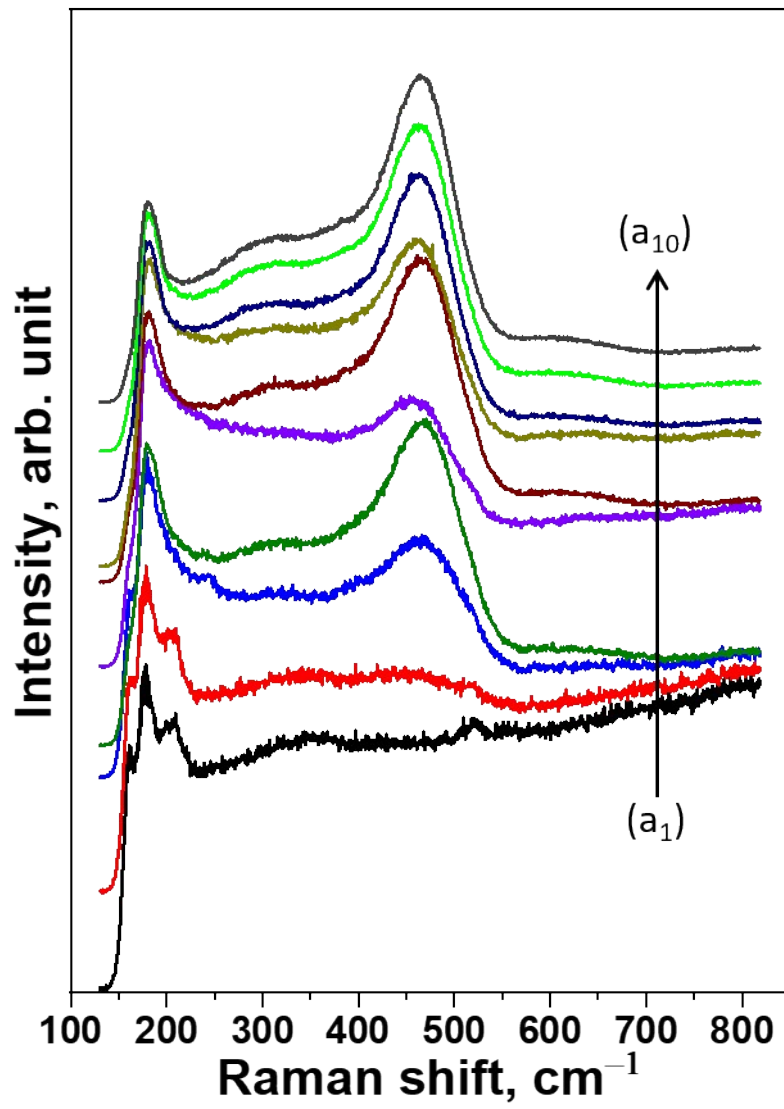


Fig. S2. Raman scattering of alternate Si layer embedded in the periodic W/Si multilayer structures;  $(a_1)$  to  $(a_{10})$  represents thickness of the alternate Si layer:  $(a_1)$  0.5 nm  $(a_2)$  0.8 nm  $(a_3)$  1.4  $(a_4)$  1.75 nm  $(a_5)$  2.3  $(a_6)$  2.4 nm  $(a_7)$  3 nm  $(a_8)$  3.5 nm  $(a_9)$  4.4 nm and  $(a_{10})$  4.8 nm.

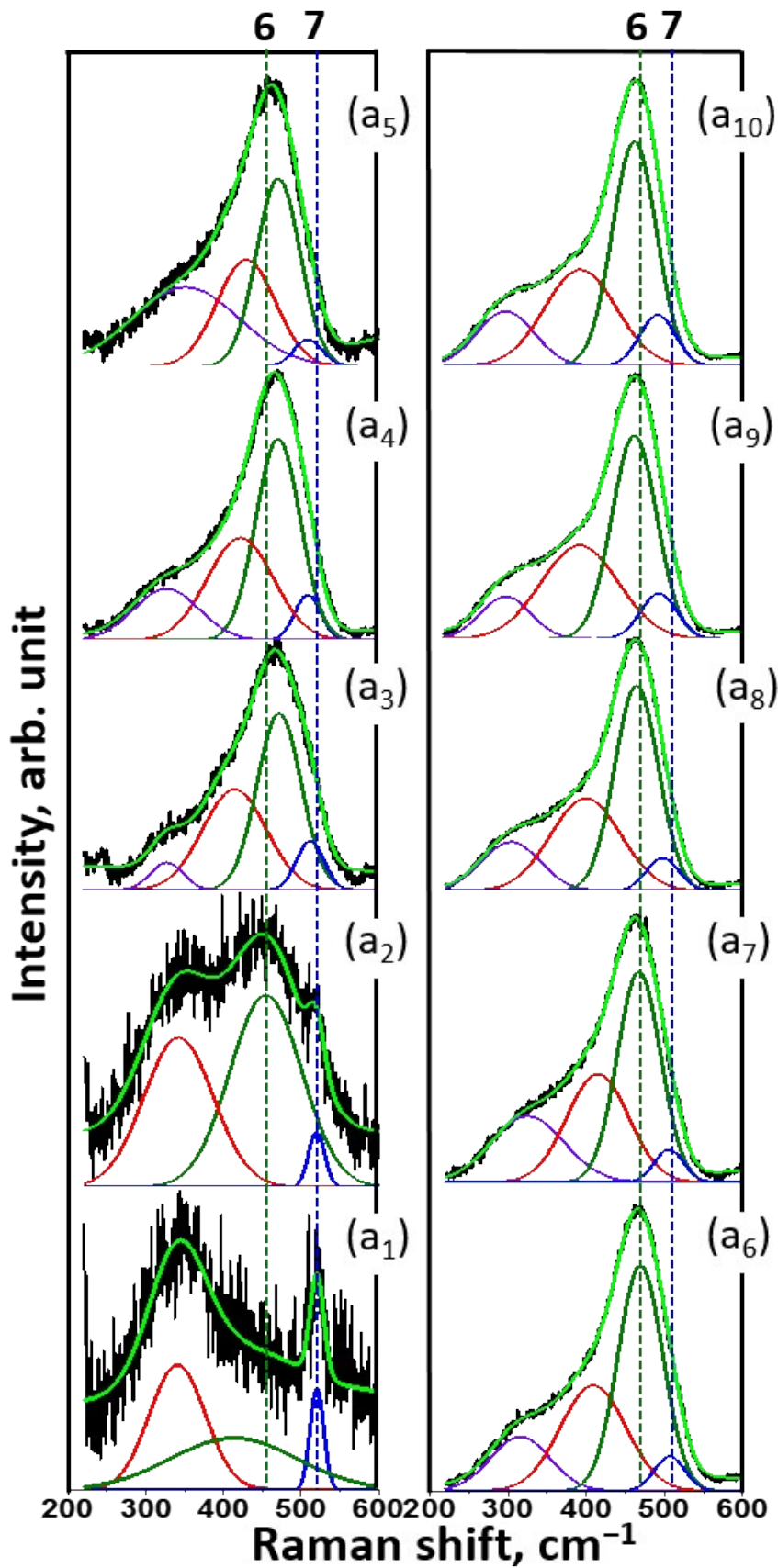


Fig. S3. Thickness dependent phonon scattering of alternate Si layer embedded in the periodic W/Si multilayer structures: (a<sub>1</sub>) 0.5 nm (a<sub>2</sub>) 0.8 nm (a<sub>3</sub>) 1.4 (a<sub>4</sub>) 1.75 nm (a<sub>5</sub>) 2.3 (a<sub>6</sub>) 2.4 nm (a<sub>7</sub>) 3 nm (a<sub>8</sub>) 3.5 nm (a<sub>9</sub>) 4.4 nm and (a<sub>10</sub>) 4.8 nm; peaks 6-TO<sub>a-Si</sub> and 7-TO<sub>c-Si</sub>.

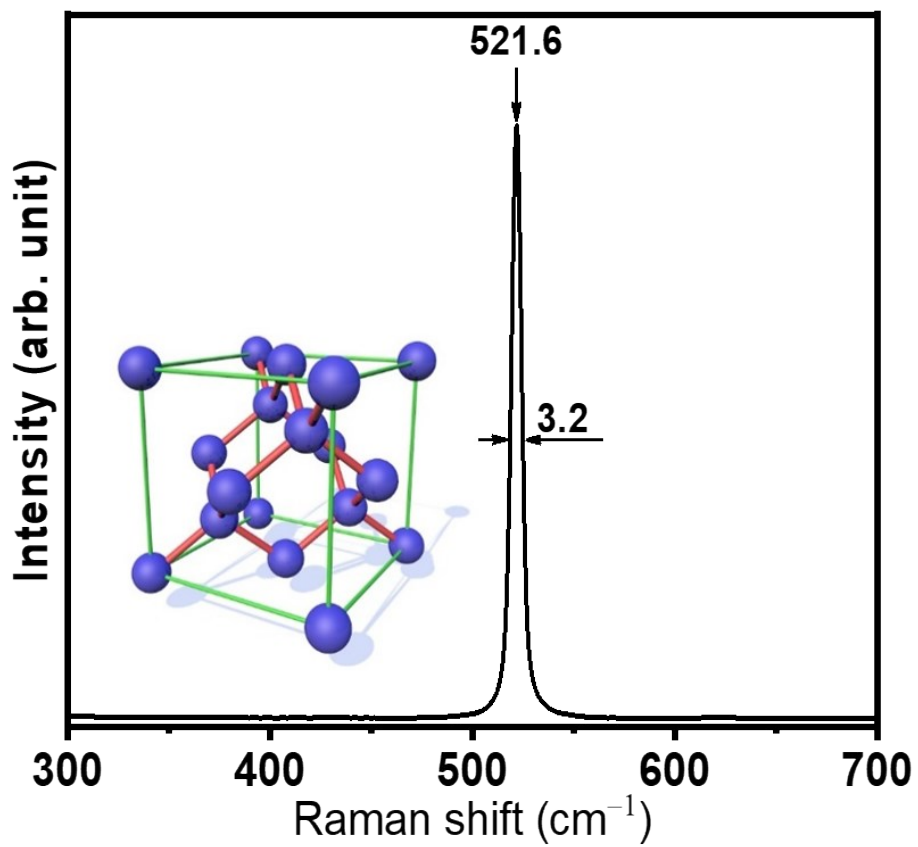


Fig. S4. Raman spectra of monocrystalline Si (100) substrate excited by laser wavelength of 473 nm.