SUPPLEMENTARY INFORMATION

Complete determination of crystallographic orientation of ReX_2 (X=S, Se) by polarized Raman spectroscopy

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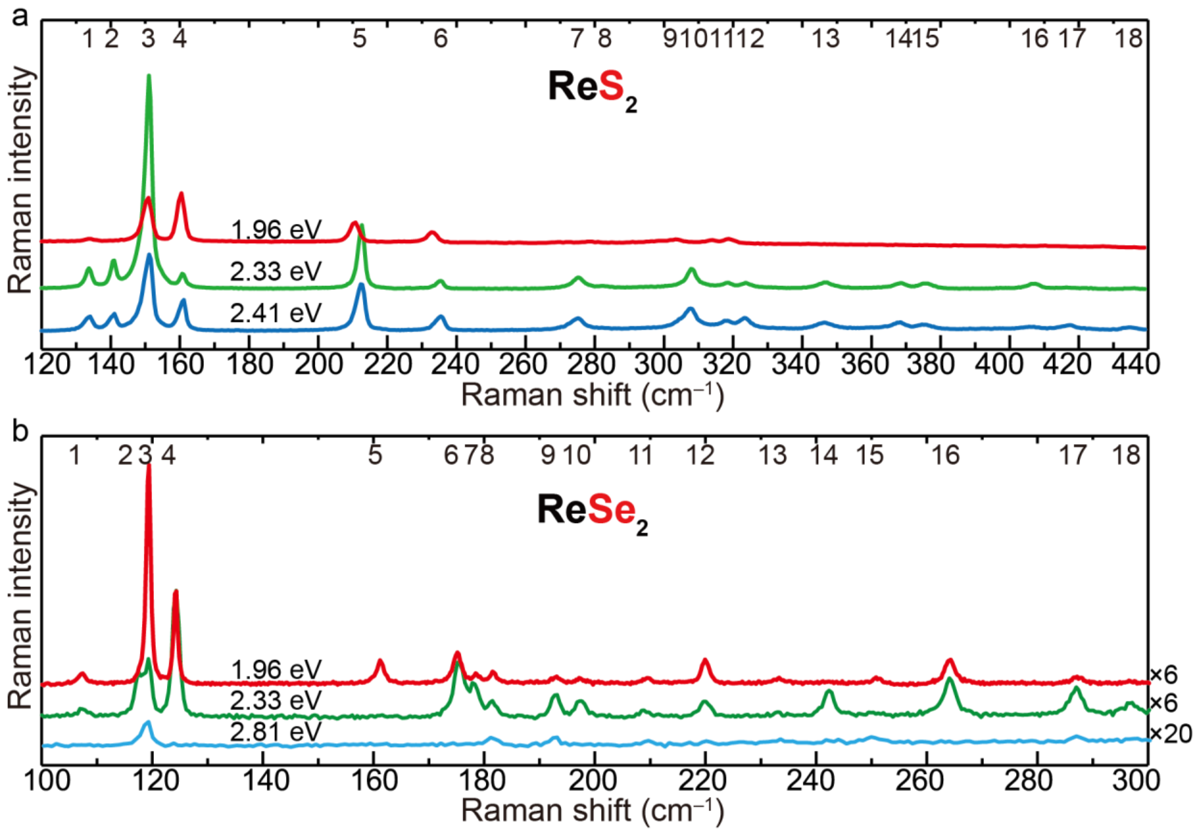

Fig. S1 Raman spectra of 1L ReS_2 and $ReSe_2$ measured with three excitation energies in the parallel-polarization configuration. The polarization angle of 20° with respect to the *b*-axis was chosen to show all 18 Raman modes: (a) ReS_2 and (b) $ReSe_2$.

	ReS_2	$ReSe_2$
mode	peak position (cm^{-1})	peak position (cm^{-1})
1	133	108
2	141	118
3	151	119
4	160	124
5	212	161
6	236	175
7	275	178
8	283	181
9	305	193
10	308	197
11	319	209
12	324	220
13	347	233
14	369	242
15	376	250
16	408	264
17	418	287
18	436	296

Table S1 Measured Raman peak positions of 18 vibrational modes of 1L ReS_2 and $ReSe_2$.

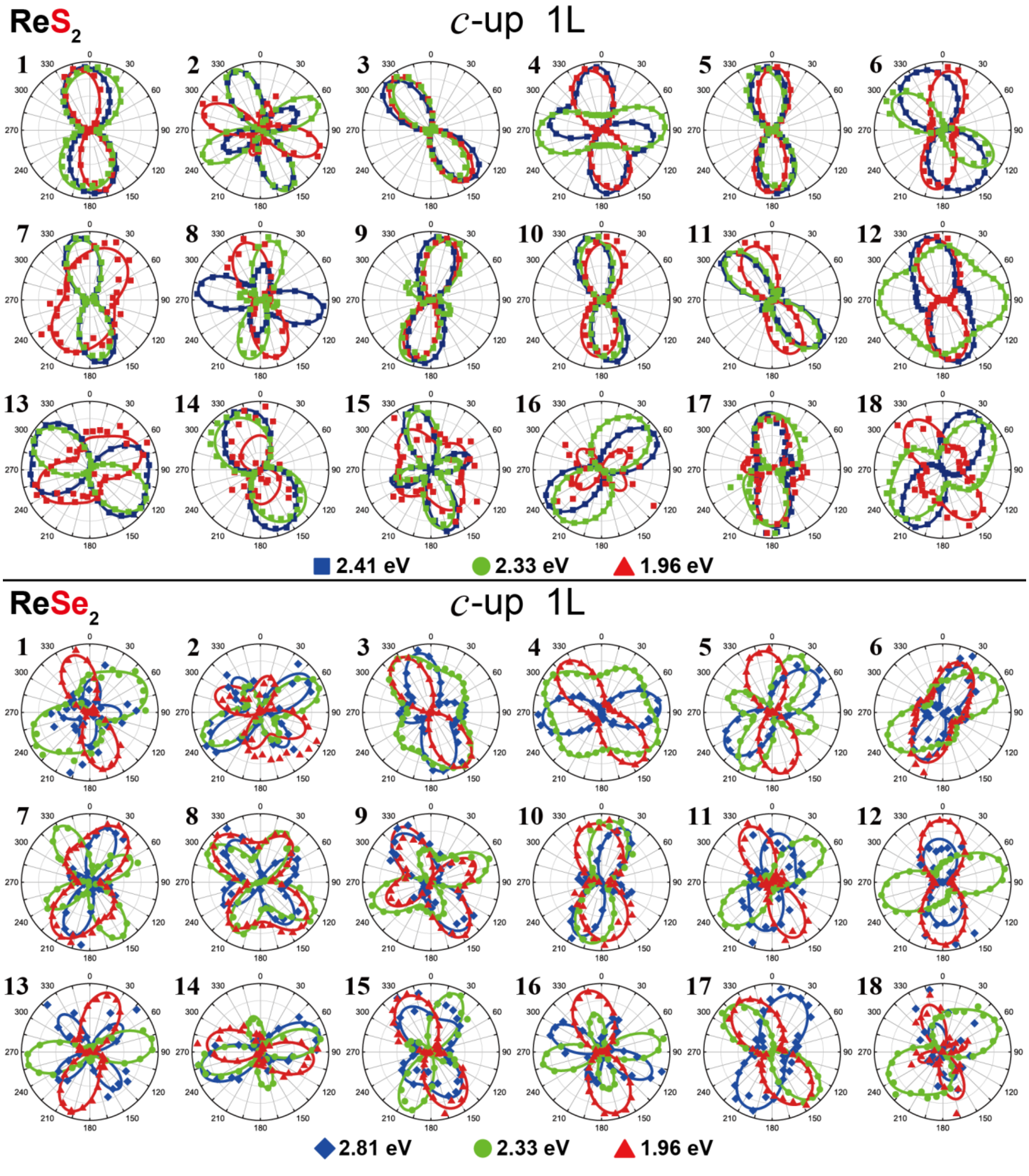

Fig. S2 Polarization dependences of 18 Raman modes of ‘*c*-up’ type monolayer ReS_2 and $ReSe_2$ measured with three different excitation energies as indicated.

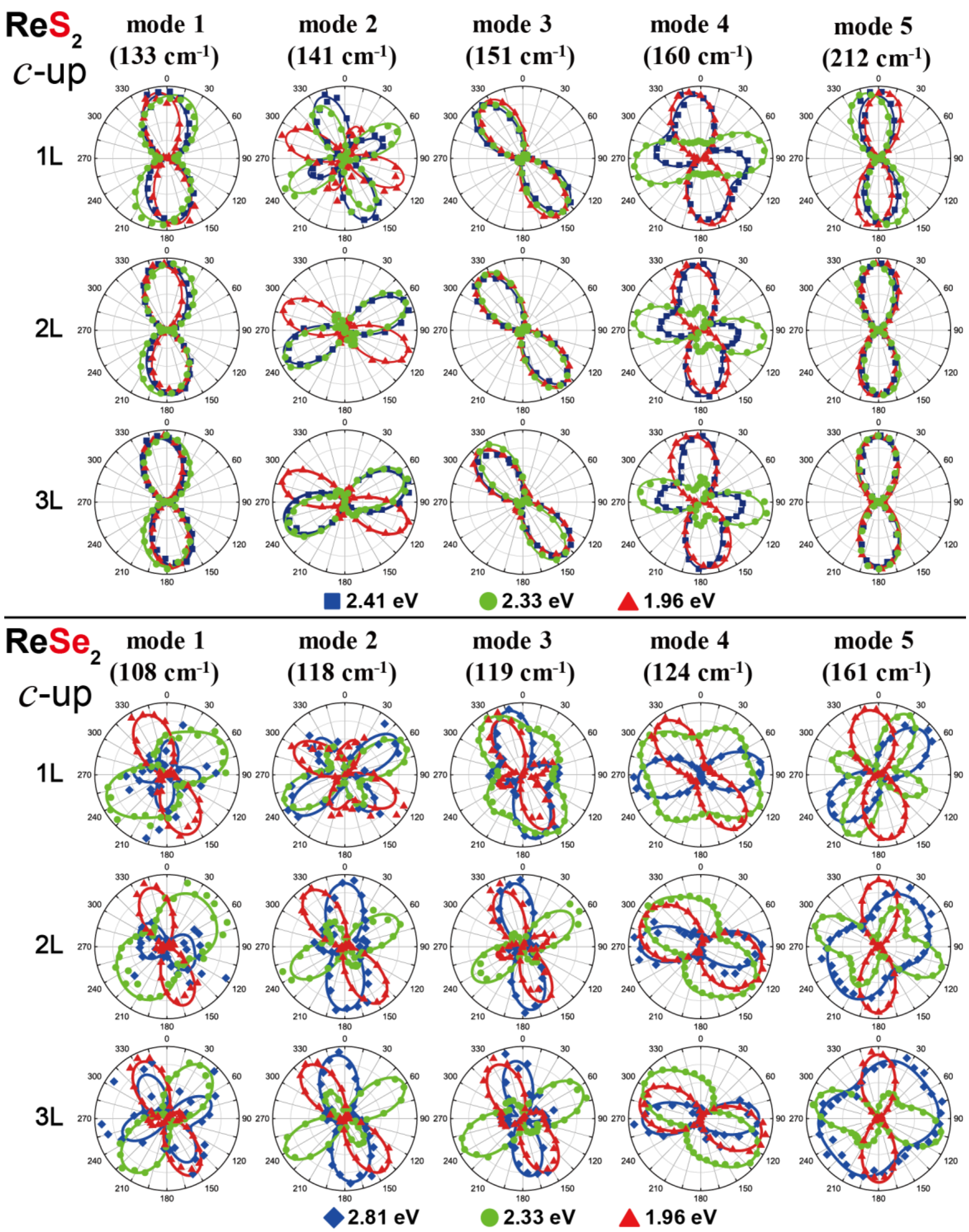

Fig. S3 Polarization dependence of modes 1 to 5 of ‘*c*-up’ type few-layer ReS_2 and $ReSe_2$.

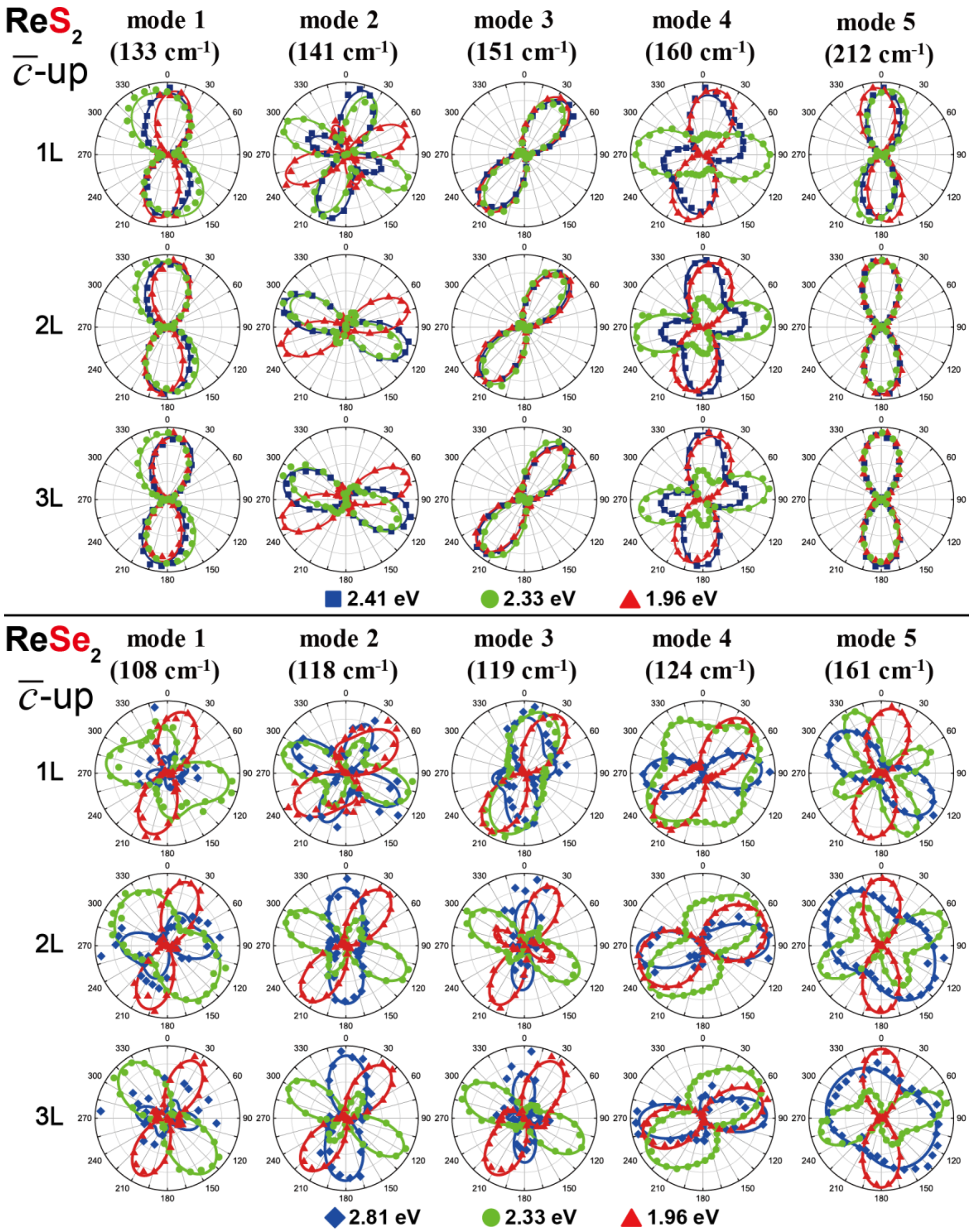

Fig. S4 Polarization dependence of modes 1 to 5 of '$\bar{c}$-up' type few-layer ReS_2 and $ReSe_2$.

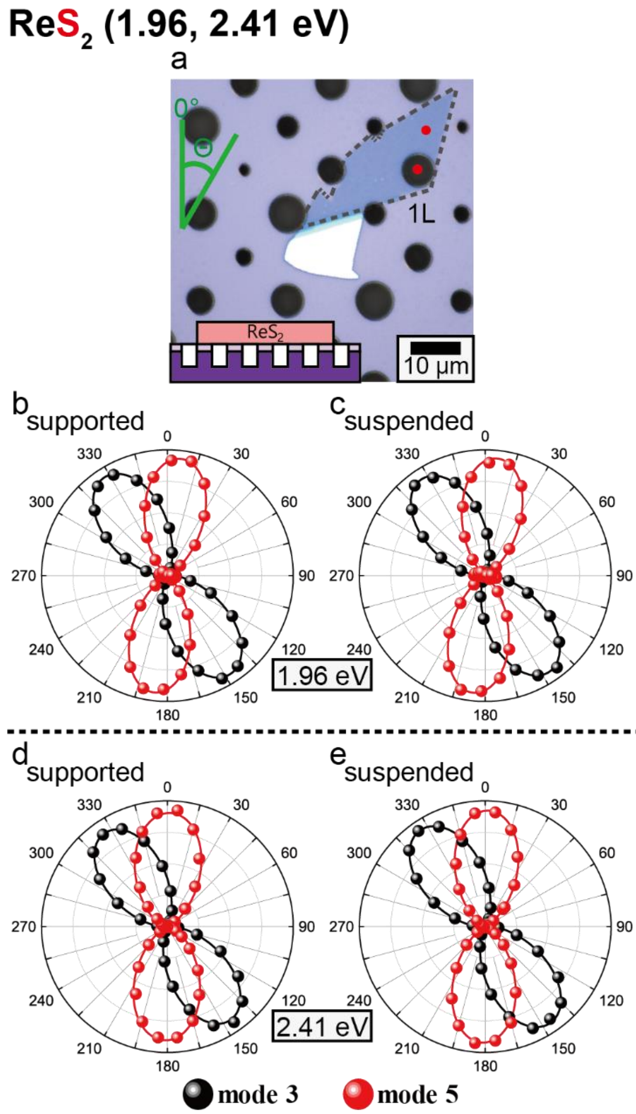

Fig. S5 Polarization dependence of free-standing 1L ReS_2 sample. (a) Optical image of free-standing 1L ReS_2 sample. The measured spots are indicated by red dots. (b, c) Polarization dependences of 1L ReS_2 sample measured with the 1.96-eV laser. (d, e) Polarization dependences of 1L ReS_2 sample measured with the 2.41-eV laser. (b, d) sample on substrate (supported) (c, e) free-standing (supported) The polarization dependences of modes 3 and 5 show no difference between the supported and the suspended parts.

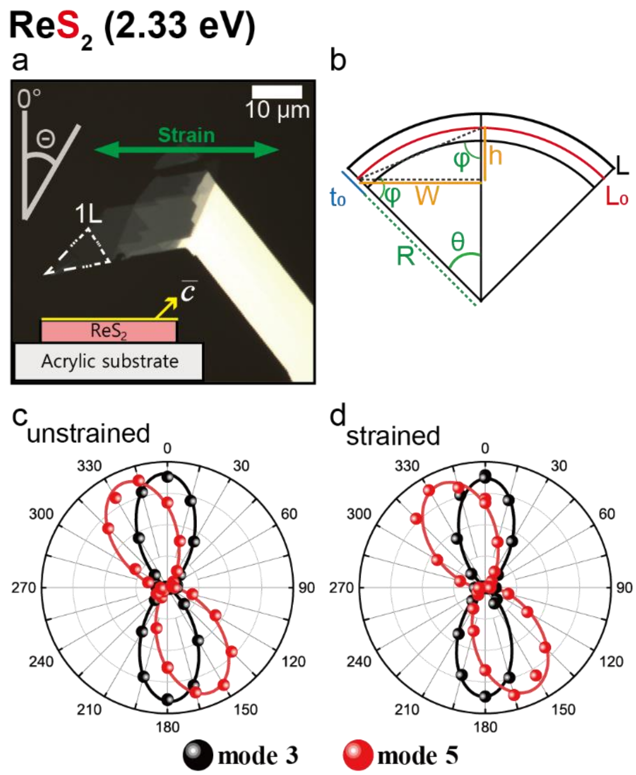

Fig. S6 Effect of strain on polarization dependences of modes 3 and 5 of 1L ReS_2. (a) Optical image of the sample on acrylic substrate. (b) Schematic of strain estimation.[1] (c, d) polarization dependences of modes 3 and 5 for (c) unstrained and (d) 1.2%-strained sample. The uniaxial strain direction is taken as 0°.

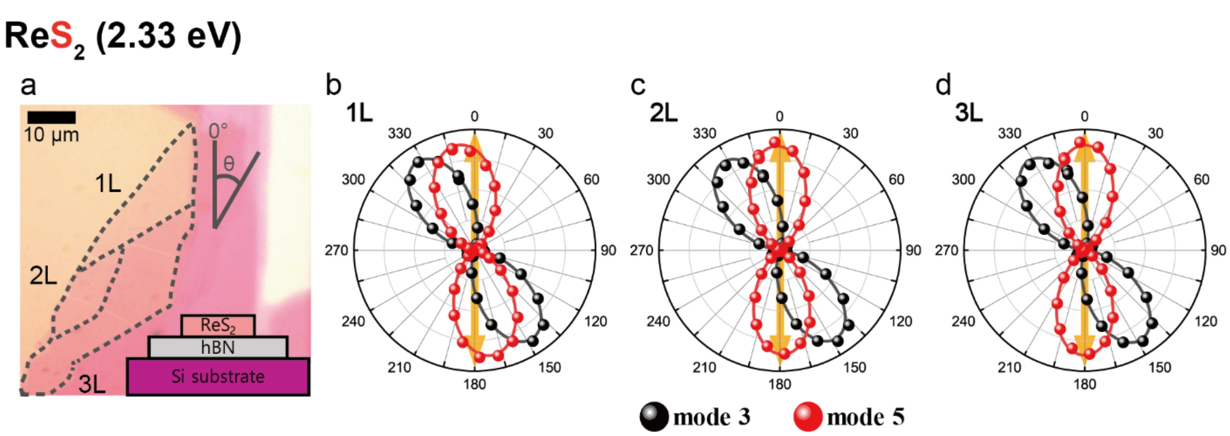

Fig. S7 Polarization dependences of modes 3 and 5 from 1L to 3L ReS_2 on hBN.

References

1. F P Beer, E R Johnston, J T Dewolf and D F Mazurek, *Mechanics of Materials*, McGraw Hill, 2012.