Figure S1. Optical image of a mxene flake at parallel (a) and cross (b) polarization; Optical image of a mxene coated with monolayer WS$_2$ measured at parallel (c) and cross (d) polarization.

Figure S2. (a) AFM image of a corner of a monolayer WS$_2$ flake marked in Figure 1h; (b) the height profile of this flake along the dashed line in (a).

Figure S3. (a) $A_{1g}$ Raman peaks of different WS$_2$ flakes; (b) The fitted $A_{1g}$ peak positions of different WS$_2$ flakes. W/O denotes the monolayer WS$_2$ flake deposited without mxene.
Figure S4. (a) PL spectra collected from locations TT1 and TT2 (marked in Figure 3a,b) the top of mxene in T1 and T2; (b) PL spectra collected from locations TT4 and TT5 (marked in Figure 3d,e) on the top of mxene in T4 and T5.

Figure S5. (a,c) Optical images of two monolayer WS₂ flakes and their corresponding PL images (b,d), respectively.