

## Isovalent alloying assisted anomalous valley Hall effect in hexagonal antiferromagnetic monolayer

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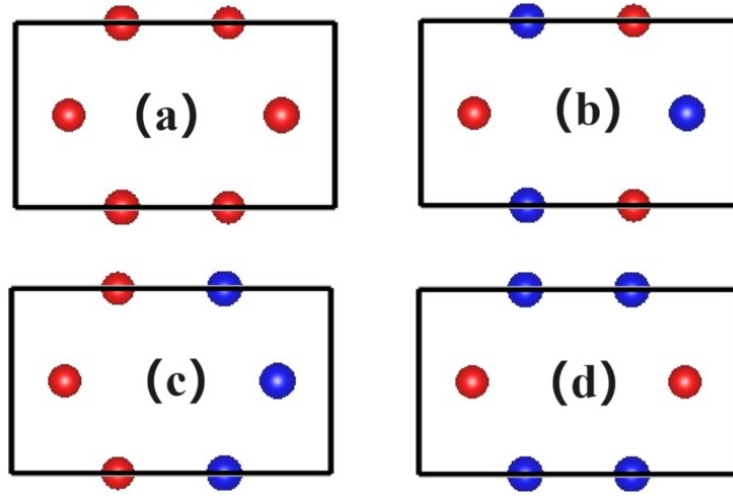


FIG. S1. (Color online) The four magnetic configurations, including FM (a), AFM1 (b), AFM2 (c), and AFM3 (d) ordering. The red (blue) balls represent the spin-up (spin-down) atoms.

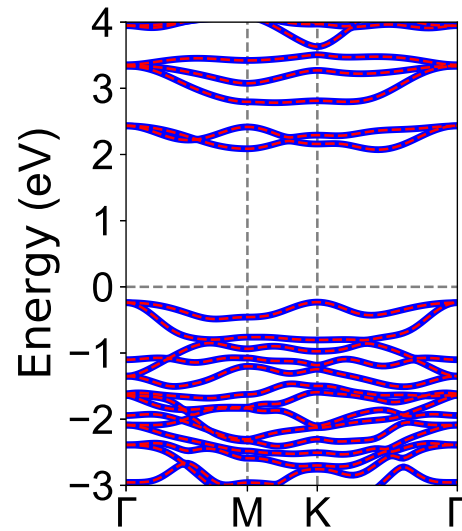


FIG. S2. (Color online) For monolayer  $\text{Cr}_2\text{C}_2\text{S}_6$ , the energy band structures without SOC, and the spin-up and spin-down channels are depicted in blue and red.

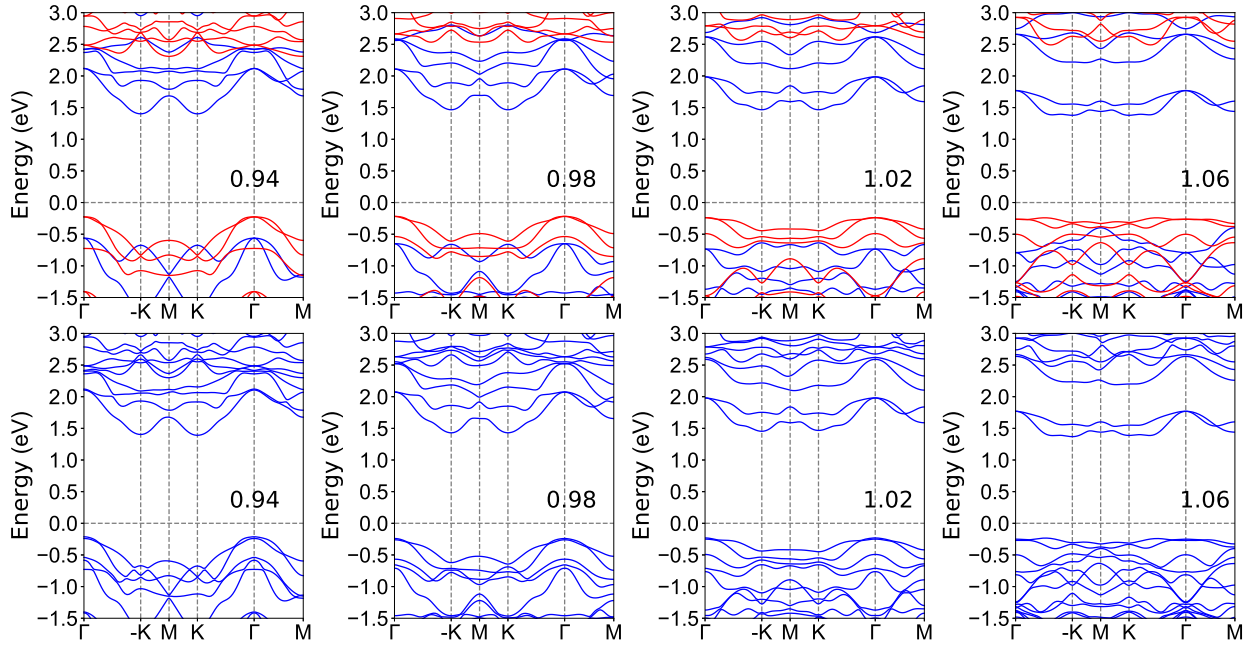


FIG. S3. (Color online) For  $\text{CrMoC}_2\text{S}_6$ , the energy band structures without SOC (top plane) and with SOC (bottom plane) at representative  $a/a_0$  (0.94, 0.98, 1.02 and 1.06).

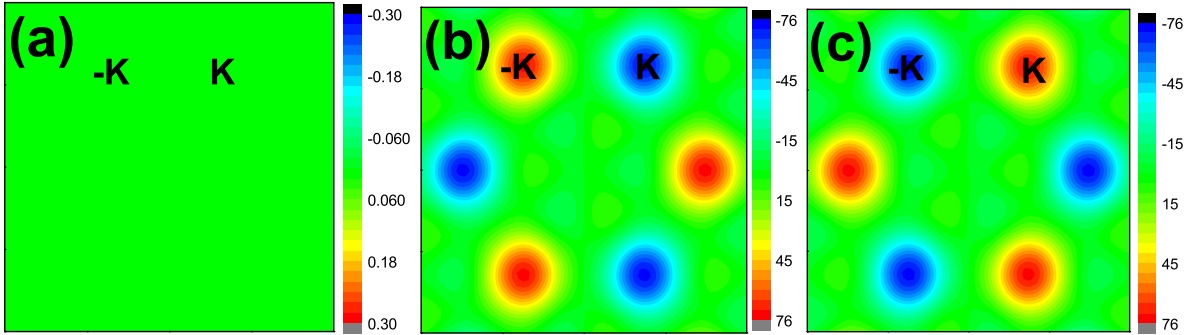


FIG. S4. (Color online) For  $\text{Cr}_2\text{C}_2\text{S}_6$ , the distribution of Berry curvatures of total (a), spin-up (b) and spin-down (c).

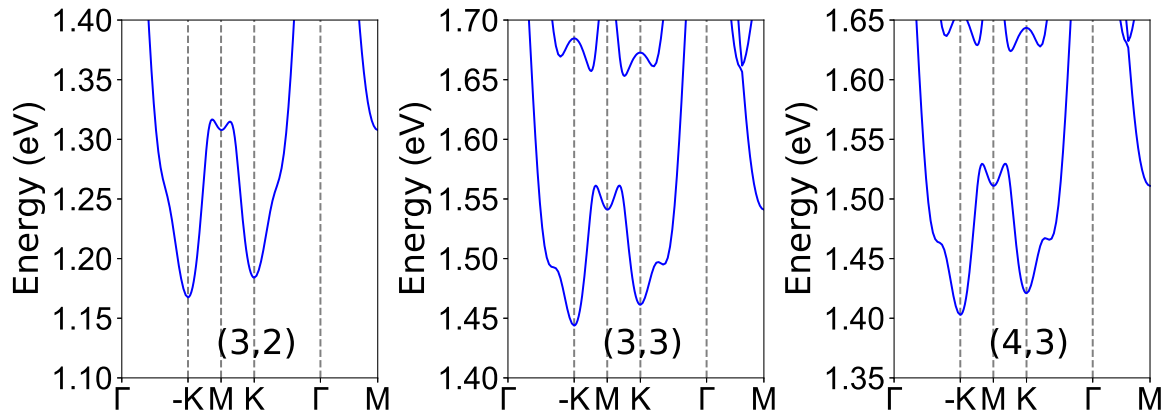


FIG. S5. (Color online) For  $\text{CrMoC}_2\text{S}_6$  with  $a/a_0=1.04$ , the energy band structures of conduction bands near the Fermi level with SOC for magnetization direction along the positive  $z$  direction at different  $U$  (Cr, Mo).