

## Electronic Supplementary Information: Unveiling hybridization between the Cr-impurity-mediated flat band and the Rashba-split state of $\alpha$ -Au/Si(111) surface

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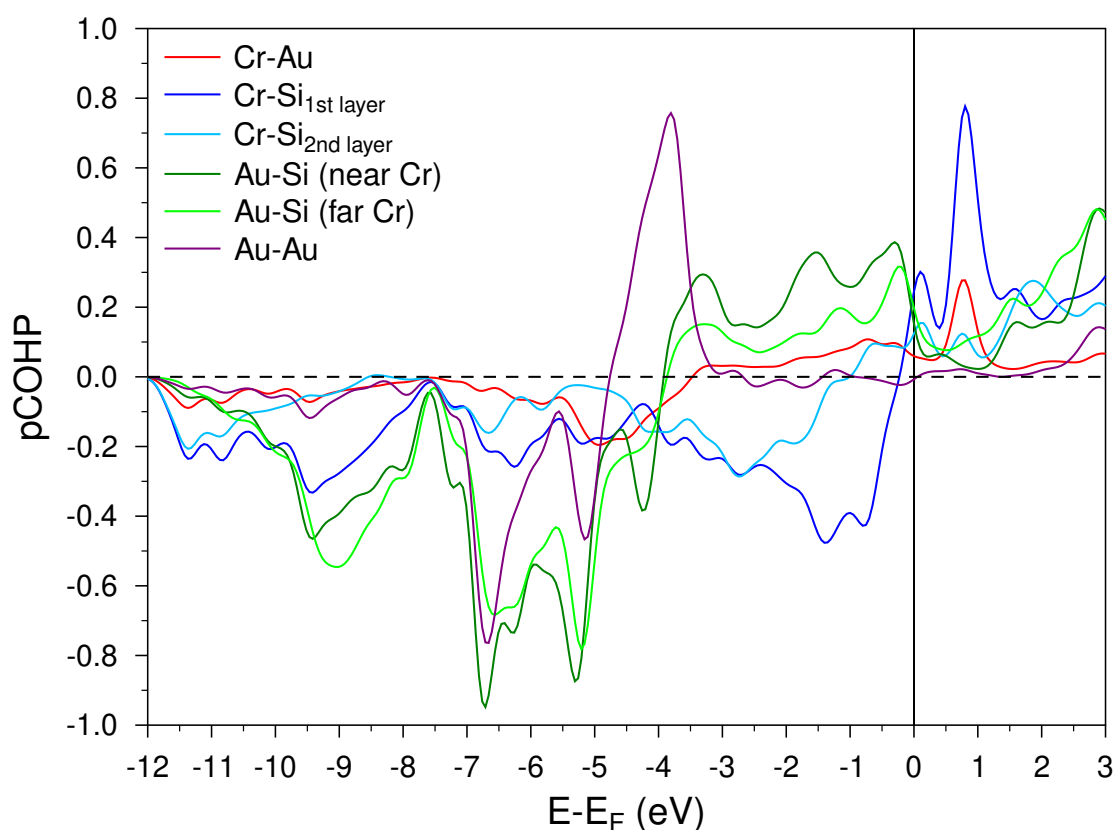


FIG. S1. Projected crystal orbital Hamilton populations (pCOHPs) for the nearest-neighbor Cr–Au, Cr–Si, Au–Au, and Au–Si bonds in the vicinity of the Cr impurity and far from it in the Cr-doped  $\alpha$ -Au/Si(111)- $\sqrt{21} \times \sqrt{21}$ . Positive(negative) pCOHP displays antibonding(bonding) regions.

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