Supporting Information

Manipulation Magnetic Skyrmions via Two-Dimensional Multiferroics $CuCrP_2Te_6$ Monolayer

*Minghao Liu[a], Tsz Lok Wan[a], Kaiying Dou[b], Lei Zhang[c], Wei Sun[d], Jiawei Jiang[e], Yandong Ma[b], Yuantong Gu[*a] and Liangzhi Kou[*a]*

[a]School of Mechanical, Medical and Process Engineering, Queensland University of Technology, Brisbane, QLD 4001, Australia

[b]School of Physics, State Key Laboratory of Crystal Materials, Shandong University, Shandanan Str. 27, Jinan 250100, P. R. China

[c]School of Chemistry and Physics, Queensland University of Technology, Brisbane, QLD 4001, Australia

[d]Shandong Provincial Key Laboratory of Preparation and Measurement of Building Materials, University of Jinan, Jinan 250022, China

[e]Tianjin Key Laboratory of Low Dimensional Materials Physics and Preparation Technology, School of Science, Tianjin University, Tianjin 300354, China

*Corresponding Authors: Yuantong.Gu@qut.edu.au, liangzhi.kou@qut.edu.au

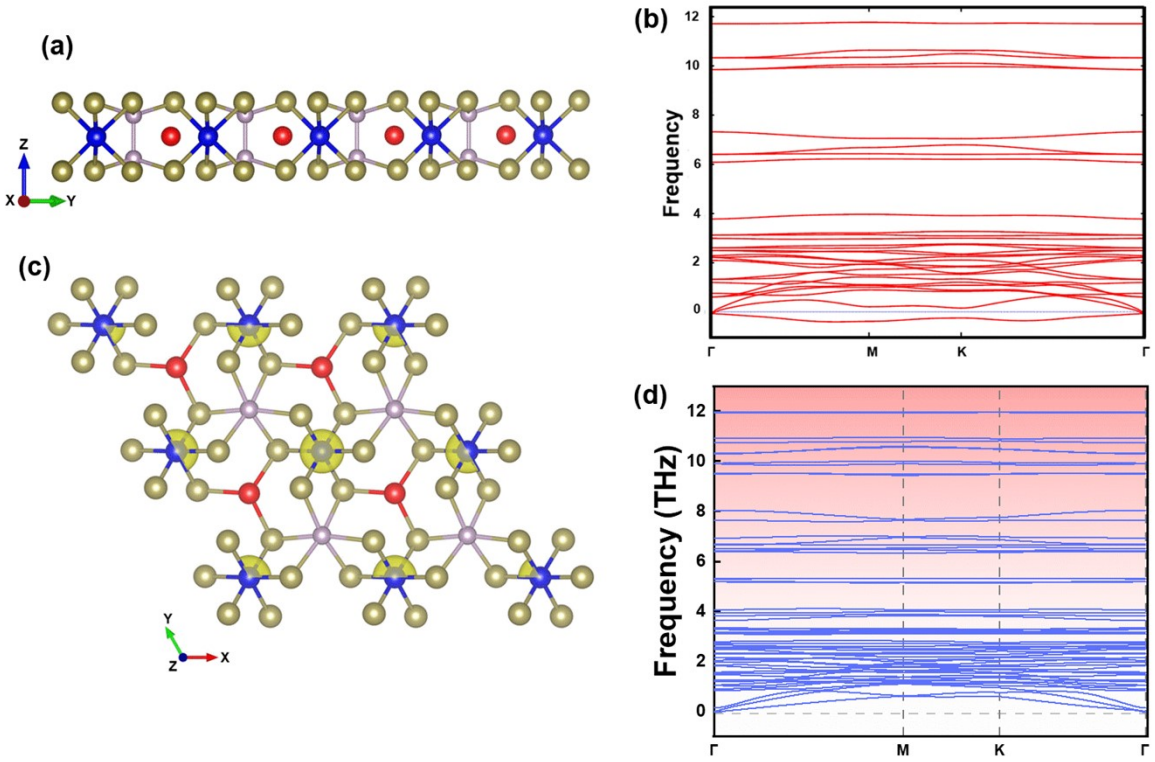

Figure S1. (a) Side view of crystal structure of monolayer $CuCrP_2Te_6$ in PE state. (b) Phonon dispersion of PE $CuCrP_2Te_6$. (c) Spin charge density of monolayer $CuCrP_2Te_6$. (d) Phonon dispersion of AFE $CuCrP_2Te_6$.

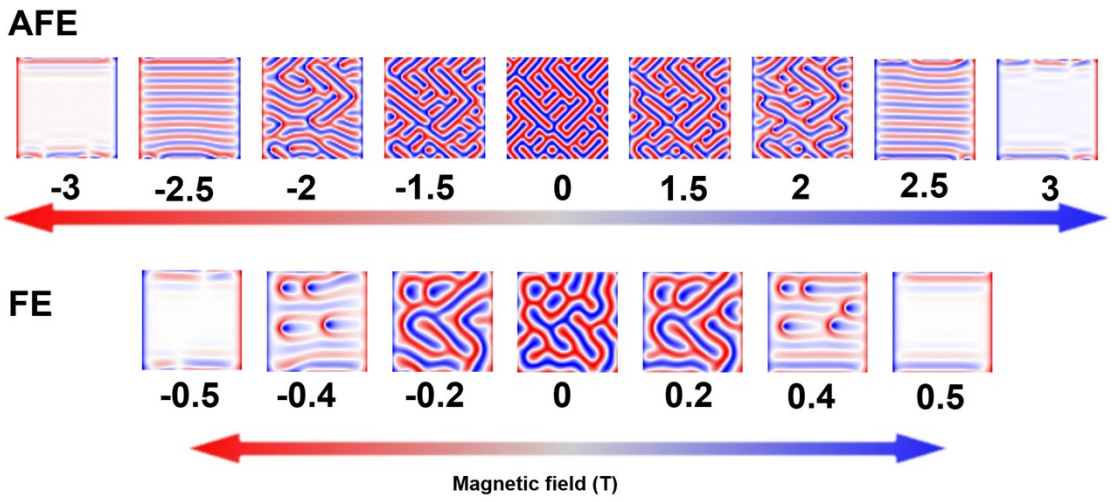

Figure S2. Spin textures diagrams as a function of in-plane external magnetic field of monolayer $CuCrP_2Te_6$.

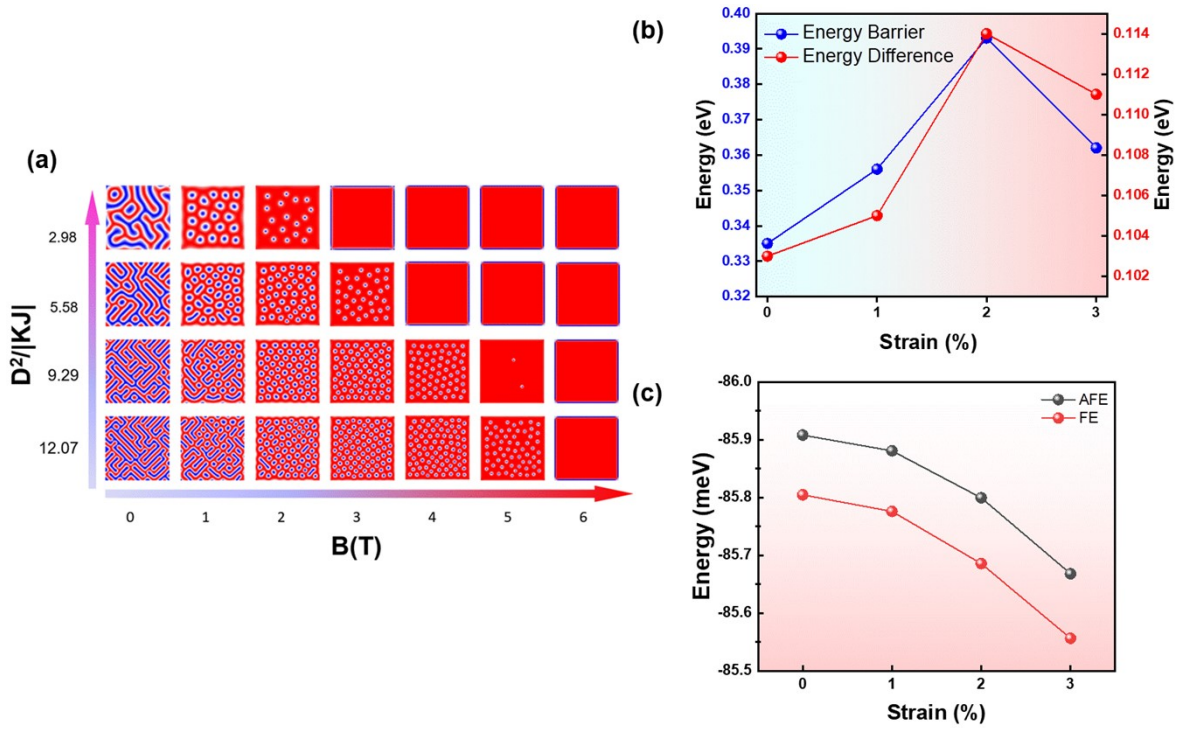

Figure S3. (a) Spin configurations as a function of external magnetic field and $D^2/|KJ|$ at 0K. (b) Energy barriers (blue line) and energy differences (red lines) between AFE and FE of monolayer $CuCrP_2Te_6$ under bi-axis strain, respectively. (c) The total energy of AFE (black line) and FE (red line) of monolayer $CuCrP_2Te_6$ under strain, respectively.