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Emergent magnetism of quasi-two-dimensional frustrated lattices by geometric design XIAORAN LIU, University of Arkansas, Fayetteville, Arkansas 72701, USA, B KIRBY, National Institute of Standards and Technology, Gaithersburg, Maryland 20899, USA, B PAL, Indian Institute of Science, Bangalore 560012, India, Y CAO, M KAREEV, University of Arkansas, Fayetteville, Arkansas 72701, USA, D SARMA, Indian Institute of Science, Bangalore 560012, India, J FREELAND, Argonne National Laboratory, Argonne, Illinois 60439, USA, P SHAFER, E ARENHOLZ, Lawrence Berkeley National Laboratory, Berkeley, California 94720, USA, J CHAKHALIAN, Rutgers University, Piscataway, New Jersey 08854, USA — When antiferromagnetic exchange interactions cannot be satisfied simultaneously on triangle-related lattices, the systems become geometrically frustrated with magnetically disordered phases significantly different from simple paramagnets. From theory, spin liquid belongs to one of these exotic states, in which a macroscopic degeneracy of the ground state coexist, giving rise to remarkable collective phenomena. So far, very few candidates have been achieved experimentally due to the challenges in fabricating the peculiar lattices with networks of triangles. Here, we report the discovery of emergent magnetic states on artificial heterostructures composed of ultrathin (111)-oriented $CoCr_2O_4$ sandwiched by nonmagnetic Al_2O_3 spacer. We reveal the degree of frustration is remarkably enhanced at the two-dimensional limit, where the slab of $CoCr_2O_4$ contains four alternating layers of triangle and kagome planes. The system sustains a spin-disordered state down to 2 K without any magnetic phase transition, indicating possible realization of a spin liquid phase.

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