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A new two-dimensional silicon crystal KISUNG CHAE, Korea Inst for Advanced Study, DUCKYOUNG KIM, Center for High Pressure Science and Technology Advanced Research, YOUNG-WOO SON, Korea Inst for Advanced Study — Silicon is one of the most extensively studied materials owing to its significance to the industry and fundamental understanding. There has been progress in searching for a new crystalline bulk phase of silicon with unusual properties. On the other hand, new phases of two-dimensional silicon have not yet been studied as much as the three-dimensional structures, and only a few can be found recently. In this talk, we report a theoretical study on a new series of two-dimensional crystalline silicon with unprecedented structural and electronic properties. The new crystal structures have the outermost layers of perfectly planar honeycomb lattices, sandwiching cubic diamond-like inner layer without coordination defect, implying the inertness of the flat surface. Most of the structures show indirect band gap of which the size decreases with increasing thickness. The new two-dimensional silicon crystals with an inert surface and a variety of electronic properties may play an important role in realizing two-dimensional electronic device of van der Waals heterojunction.

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