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Optimizing the design of artificial lattices LIANG Z. TAN, STEVEN G. LOUIE, Department of Physics, University of California at Berkeley and Materials Sciences Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720 — Artificial crystal lattices are a powerful tool for studying other condensed matter systems because they are easily tunable and may be controllably fabricated in the laboratory. For example, artificial graphene can be created out of arrays of CO molecules arranged on a Cu(111) surface. We generalize the idea of artificial graphene, and propose new, unusual band structures that can result from different types of artificial lattices. Because of the high degree of freedom in creating artificial lattices, the task of systematically designing artificial lattices that exhibit these unusual band structures is non-trivial. We address this optimization problem, and show that new physics can be observed in presently feasible artificial crystal lattices. This work was supported by NSF grant No. DMR10-1006184 and U.S. DOE under Contract No. DE-AC02-05CH11231. Computational resources have been provided by NERSC and XSEDE.

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