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**Two-dimensional Hubbard model on a honeycomb lattice** KUN FANG, University of University, GAYANA FERNANDO, University of Connectcut, ALEXANDER BALATSKY, Los Alamos National Lab, ARMEN KOCHARIAN, California State University, KALUM PALANDAGE, Trinity College — In the honeycomb lattice, a combination of nontrivial topology and electronic correlations drives a great variety of phenomena. We study the 2-dimensional fermionic Hubbard model on a honeycomb lattice using exact diagonalization method at various onsite interaction strength U values. By introducing holes in the model at different filling levels, we analyze the charge gap instability of the lattice which indicates the possibility the system going into a paired state. We further monitor the one-particle excitation spectrum and density of states at various k-points. We find that the electronic interaction introduces quasiparticle states around the Fermi level and the system can undergo a metal-insulator transition. /newline /newline The authors acknowledge the computing facilities provided by the Center for Integrated Nanotechnologies, a U.S. Department of Energy, Office of Basic Energy Sciences user facility at Los Alamos National Laboratory (Contract DE-AC52-06NA25396) and Sandia National Laboratories (Contract DE-AC04-94AL85000) and the Center for Functional Nanomaterials, Brookhaven National Laboratory supported by the U.S. Department of Energy, Office of Basic Energy Sciences, under Contract No.DE-AC02-98CH10886.

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