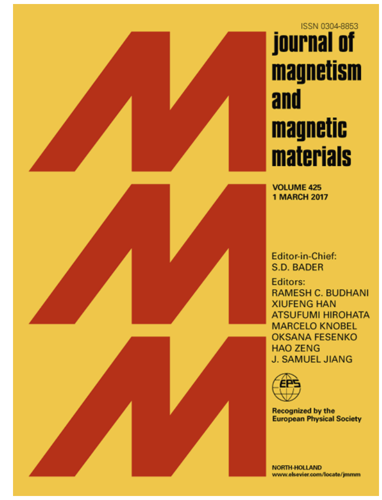

Research articles

Spin- and valley-dependent electronic band structure and electronic heat capacity of ferromagnetic silicene in the presence of strain, exchange field and Rashba spin-orbit coupling

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Spin- and valley-dependent electronic band structure and electronic heat capacity of ferromagnetic silicene in the presence of strain, exchange field and Rashba spin-orbit coupling

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Abstract

We studied how the strain, induced exchange field and extrinsic Rashba spin-orbit coupling (RSOC) enhance the electronic band structure (EBS) and electronic heat capacity (EHC) of ferromagnetic silicene in presence of external electric field (EF) by using the Kane-Mele Hamiltonian, Dirac cone approximation and the Green's function approach. Particular attention is paid to investigate the EHC of spin-up and spin-down bands at Dirac K and K' points. We have varied the EF, strain, exchange field and RSOC to tune the energy of inter-band transitions and consequently EHC, leading to very promising features for future applications. Evaluation of EF exhibits three phases: Topological insulator (TI), valley-spin polarized metal (VSPM) and band insulator (BI) at given aforementioned parameters. As a new finding, we have found a quantum anomalous Hall phase in BI regime at strong RSOCs. Interestingly, strain changes the effective mass of carriers, resulting in EHC behaviors. Here, exchange field has the same behavior with EF. Finally, we have confirmed the reported and expected symmetry results for both Dirac points and spins with the study of valley-dependent EHC.

Keywords: *Ferromagnetic silicene; Green's function; Heat capacity; Rashba spin-orbit coupling; Phase; Hall effect*

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