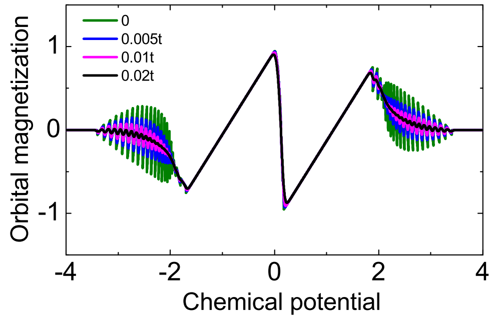

FIG. 8: (Color online). The magnetization $\mathcal{M}$ as a function of the electron chemical potential at the field f=12/49 with different temperatures.

In the above discussions on the orbital magnetization of the 2D kagomé lattice, we have concentrated on the zero-temperature limit and omitted finite-temperature effect. Now let us briefly consider the more realistic cases in which the finite-temperature effect is included. Figure 8 plots the orbital magnetization at the field f=12/49 with different temperatures k_BT=0, 0.005, 0.01, and 0.02, respectively. From Fig. 8, one can find that the magnetic oscillations are suppressed by thermal broadening.

IV. SUMMARY

In summary, we have theoretically investigated the orbital magnetization of a 2D kagomé lattice in a perpendicular magnetic field. Here, the orbital magnetization includes a conventional term and a Berry-phase term, which play different roles in metallic and insulating regions. As examples, we have carefully discussed the orbital magnetization and its two components at the fields f=1/4, 1/3, and 1/6, respectively. By varying the Fermi energy μ_0, we have obtained the following results: (i) The conventional term and the Berry-phase term give the opposite contributions, with their magnitudes increasing (decreasing) with increasing (decreasing) the Fermi energy in metallic regions; (ii) The conventional term keeps unchanged in insulating regions; (iii) The slope of the Berry-phase term in insulating regions is proportional to the system's Hall conductance. When the flux is applied near a commensurate one (for example, 1/4), the magnetic dHvA oscillations develop a fractal structure, i.e., the orbital magnetization rapidly oscillates when the Fermi energy varies through the split subbands. The finite-temperature effect has also been shown to suppress the oscillating