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Two-peak structure in temperature dependence of the specific heat in spin-S Heisenberg-Kitaev models on a honeycomb lattice TAKAFUMI SUZUKI, University of Hyogo — An interesting phase called as the Kitaev's spin liquid (KSL) phase exists in the S=1/2 Heisenberg-Kitaev (HK) model on a honeycomb lattice. The low-energy excitations in the KSL state is characterized by Majorana fermions resulting from fractionalization of quantum spins. In the Kitaev model [PRL 113, 197205 (2014)], the fractionalization is observed as a two peak structure in the temperature dependence of the specific heat $C(T)$. This two peak structure of $C(T)$ survives in the magnetic ordered phase, if the system is located in the vicinity of the KSL phase, and this offers criteria for measuring the closeness to the KSL phase [PRB 93, 174425 (2016)]. Similarly, it has been studied that $C(T)$ of the HK model at the large S limit (classical HK model) shows a two peak structure [PRL 109, 187201 (2012)]. In this study, we have calculated $C(T)$ for spin-S HK model and found that the origin of two peaks is different between the quantum and classical cases. The difference is evident in the higher temperature peaks in $C(T)$: For the quantum spin S=1/2, the higher temperature peak shrinks and the two-peak structure disappears for $3/2 <$S. At the classical limit, an additional tiny peak seems to appear, independently of the two-peak structures in the quantum case.

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