PHENOMENOLOGICAL THEORY OF NEW MULTIPLE SPIN DENSITY WAVES IN FCC TRANSITION METALS

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Recent molecular-dynamics calculations and the first-principles band calculations predicted a new multiple spin density wave state whose principal waves consist of 3-$Q(Q = 0.6)$ in the cubic γ-Fe. To clarify such a possibility from the phenomenological point of view, we investigated the stability using the Ginzburg-Landau free energy. Taking into account the terms up to the 4-th order, we obtained the magnetic phase diagram in the space of the Landau parameters. Our diagram shows up that the phase change NM $\rightarrow$ AF $\rightarrow$ 3- $\hat{Q}$ $\rightarrow$ 3-Q with increasing volume, which is consistent with the microscopic prediction, is possible in addition to the change NM $\rightarrow$ AF $\rightarrow$ Helical. Here NM, AF, 3-$\hat{Q}$ denote the nonmagnetic, the first-kind antiferromagnetic, and the 3-$Q(Q = 1)$ states, respectively.

9.7 cm

13.4 cm

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