
Multiple hysteresis behaviors in spin models

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Abstract

Hysteresis is simply defined as history dependent variation of the magnetization with magnetic field, and it is one of the important properties of magnetic materials. Multiple hysteresis behaviors may appear in some physical systems such as Fe₃O₄ / Mn₃O₃ superlattices [2] and molecular based magnetic materials [2]. Theoretically, it was shown that some spin models in different geometries could exhibit multiple hysteresis behaviors, e.g. magnetic nanowires [3].

Recently, it has been observed that S-1 Anisotropic Heisenberg model could display double hysteresis behavior [4]. In the isotropic Heisenberg limit, this behavior was never observed while the highly anisotropic limit (i.e. Ising model) has double hysteresis behavior [5]. Then, several question about the multiple hysteresis behaviors in other spin models may arise such that "Can the higher spin models exhibit multiple hysteresis behaviors ?" or "What is the effect of quenched disorder on these type phenomena ?"

Hence, the aim of this talk is to present the results obtained regarding the higher spin models within the effective field theory, which is one of the most widely used methods in statistical physics of magnetism. Besides, the effect of the disorder on these hysteresis behaviors will also be discussed.

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