A coupled spin-electron diamond chain with different Landé g-factors of localized Ising spins and mobile electrons

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ABSTRACT

The correlated spin-electron models are subject of intensive studies, because they often display unusual cooperative phenomena commonly found in real magnetic materials. In the present work we will generalize exact solutions for a coupled spin-electron diamond chain with localized Ising spins placed on its nodal sites and mobile electrons delocalized over interstitial sites [1, 2] by taking into account the difference for the Landé g-factors of the localized spins and mobile electrons. It will be shown that the overall ground-state phase diagram totally consists of four different phases: two ferrimagnetic, the unsaturated and saturated paramagnetic phases. Both ferrimagnetic phases as well as the unsaturated paramagnetic phase are revealed in a low-temperature magnetization curve through intermediate magnetization plateaux. Interestingly, the unsaturated paramagnetic phase is quantum in its character as evidenced by the concurrence, which will be used for quantification of bipartite quantum entanglement at zero as well as non-zero temperatures [2]. We will also demonstrate that the magnetic field can under certain conditions induce the quantum entanglement above the disentangled zero-field ground state, which is in contrast with general expectations.

References

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