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**LOWEST ENERGY STATES OF HUBBARD LADDER MODEL  
WITH INFINITE ELECTRON REPULSION**

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**Abstract**

We apply cyclic spin permutation formalism to the study the lowest energy states of the infinite-repulsion Hubbard model on  $n$ -leg ladders. For ladder fragments with the electron densities  $\rho = 1 - (2n)^{-1}$  we show that the alternation in the values of one-site energies for neighboring rungs leads to the stabilization of the ground state of ladder fragments with the maximal value of the total spin ( $S_0=S_{\max}$ ) against the increase of the interactions between rungs. The decrease of the electron density may lead to the destruction of this state. For two leg ladder fragments at the density  $\rho > 0.8$  we find a possibility of the transition between the ground states with  $S_0=S_{\max}$  and  $S_0=S_{\max} - 1$  with the decrease of the interaction between legs.

Keywords: Hubbard ladder model, energy spectrum, ground state spin

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**Introduction**

Low-dimensional magnets and magnetic clusters based on the transition metal compounds have attracted much attention because of their interesting physics and potential applications in nanotechnologies [1,2]. Traditionally, the magnetic properties of these materials are described by a Heisenberg spin model which is formally identical to the covalent-space Pauling-Wheland valence band model [3]. The appearance of itinerant electrons due to the acceptor doping may change significantly the magnetic properties of these materials. For example, the phase diagrams of the corresponding molecular magnets acquire a variety of low-

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