Groundstate properties of disordered and dimerized spin chains

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Recent experiments on $CuGeO_3$ and NaV_2O_5, which show at low temperature a transition to a non-magnetic ground state accompanied by a structural transition, led to renewed interest in spin-Peierls systems. In this context, we have investigated the ground state properties of the XXZ model, defined by ...

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... lattice energy.

(ii) Antiferromagnetic coupling, $\Delta < 0$ $(V > 0)$: A Peierls-type energy gap opens for small Δ, which is strongly enhanced when Δ decreases to -1. For $\Delta \ll -1$, the gap is given by $2J|\Delta|$, a result which is apparent in the fermionic model (for half-filling and large V, a "hop" of a fermion costs the energy V).

The magnetization (filling) dependence of our results will be discussed.

[1] C. Schuster and U. Eckern, Eur. Phys. J. B **5**, 395-402 (1998); C. Schuster, Ph. D. thesis, University of Augsburg, 1999.
[2] P. Schmitteckert, T. Schulze, C. Schuster, P. Schwab, and U. Eckern, Phys. Rev. Lett. **80**, 560 (1998).