

Ground state phase diagram of the spin-1 bilinear-biquadratic Heisenberg model on a honeycomb lattice

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We have precisely determined the ground state phase diagram of the spin-1 bilinear-biquadratic Heisenberg model on a honeycomb lattice using the tensor renormalization group method. We find that the ferromagnetic, antiferromagnetic, and ferroquadrupolar phases are stable against quantum fluctuations. However, in the phase where the ground state is staggered quadrupolar ordered in the classical limit, we find that quantum fluctuations suppress completely all magnetic orders and lead to a magnetically disordered phase with a spin gap.