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Effects of surface waves on crystals of molecular magnets: Semi-classical approach.[1] CARLOS CALERO, EUGENE CHUDNOVSKY, Department of Physics and Astronomy of Lehman College (CUNY) — The effect of surface waves on the spin-state of a molecular magnet is theoretically investigated. As it was recently noted, the anisotropy axis of a molecular magnet is locally defined, so that its direction is modified by local distortions of the lattice. Therefore, its spin-Hamiltonian must be generally written as $\mathcal{H} = \exp[-\imath \mathbf{S} \cdot \delta\phi]\mathcal{H}_{\mathcal{A}} \exp[\imath \mathbf{S} \cdot \delta\phi] + \mathcal{H}_{\mathcal{Z}}$, where $\delta\phi = \frac{1}{2}\nabla \times \mathbf{u}(\mathbf{r})$ is the angle of the local rotation induced by the displacement field $\mathbf{u}(\mathbf{r})$, $\mathcal{H}_{\mathcal{A}}$ is the anisotropy Hamiltonian and $\mathcal{H}_{\mathcal{Z}}$ is the Zeeman term. Based on this idea we obtain the Hamiltonian describing the interaction between spin and the distortion of the lattice produced by the surface waves. We then analyze the spin-dynamics of a single nanomagnet by employing a semi-classical approach: the displacement field $\mathbf{u}(\mathbf{r})$ is treated as a continuous classical field, whereas the spin-state of the nanomagnet is described quantum-mechanically. Analytical formulas for the spin-dynamics are given for certain geometrical arrangements.

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