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Interplay between magnetic anisotropy and vibron-assisted tunneling in a single-molecule magnet transistor[1] KYUNGWHA PARK, ALEXANDER MCCASKEY, YOH YAMAMOTO, MICHAEL WARNOCK, Virginia Tech, ENRIQUE BURZURI, HERRE VAN DER ZANT, TU Delft —
Molecules trapped in single-molecule devices vibrate with discrete frequencies characteristic to the molecules, and the molecular vibrations can couple to electronic charge and/or spin degrees of freedom. For a significant electron-vibron coupling, electrons may tunnel via the vibrational excitations unique to the molecules. Recently, electron transport via individual anisotropic magnetic molecules (referred to as single-molecule magnets) has been observed in single-molecule transistors. A single-molecule magnet has a large spin moment and a large magnetic anisotropy barrier. So far, studies of electron-vibron coupling effects in single-molecule devices, are mainly for isotropic molecules. Here we investigate how the electron-vibron coupling influences electron transport via a single-molecule magnet Fe_4, by using a model Hamiltonian with parameter values obtained from density-functional theory (arXiv:1411.2677). We show that the magnetic anisotropy of the Fe_4 induces new features in vibrational conductance peaks and creates vibrational satellite peaks. The main and satellite peak heights have a strong, unusual dependence on the direction and magnitude of applied magnetic field, because the magnetic anisotropy barrier is comparable to vibrational energies.

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