Electrical and magnetic properties of ferritin: electron transport phenomena and electron paramagnetic resonance

Labra Muñoz, J.A.

Propositions

accompanying the dissertation

ELECTRICAL AND MAGNETIC PROPERTIES OF FERRITIN: ELECTRON TRANSPORT PHENOMENA AND ELECTRON PARAMAGNETIC RESONANCE

1. Having a sufficiently high gate coupling and efficient deposition and trapping protocols are the most important issues that need to be addressed for fabricating a single-electron transistor that is based on nanoparticles. (Chapters 2 and 4)
2. Ferritin single-electron transistors can form the base for bio-based logic components. (Chapters 3 and 4)
3. Only the combined study of electron paramagnetic resonance (EPR) and magnetometry techniques leads to a plausible model capable of describing ferritin's magnetic properties. (Chapter 5)
4. EPR researchers should not rely on automatic fitting to interpret broad featureless EPR spectra, such as those of ferritin. (Chapter 5)
5. Although sometimes useful, singular value decomposition algorithms should be replaced by machine learning to identify the individual features present in EPR spectra. [Taguchi *et al.*, J. Phys. Chem. Lett. **10**, 1115(2019)]
6. The electrical characterization of single gold nanoparticles, typically used as charge-transport reference samples in single-nanoparticle experiments, is not readily available because of the many different varieties of gold particles used in the literature. [Homberger, Phil. Trans. R. Soc. A., **368**, 1405 (2010)]
7. In spite of its large computational cost, the master equation (analytical) model should always be used first for obtaining accurate single-electron transistor modeling. [Patel, Microsyst. Technol., **27**, 1863 (2021)]
8. Contrary to the widely accepted belief, fully iron-loaded ferritin cannot contain 4500 iron atoms. [Hagen, Metallomics, **14**, mfac063 (2022)]
9. Science must adapt to social media not only to broaden outreach to the general public but also to communicate scientific knowledge to the scientific community.
10. To increase the participation of women in science, already in preschool girls should be encouraged to play with rockets.

Jacqueline Andrea Labra Muñoz
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