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

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LIST OF PUBLICATIONS

7. **J. A. Labra-Muñoz***, L. Bossoni*, H. S. J. van der Zant, V. Čaluković, A. Lefering, R. Egli, M. Huber. *In-depth magnetometry and EPR analysis of the spin structure of human-liver ferritin: from DC to 9 GHz*. Phys. Chem. Chem. Phys., accepted for publication.
6. **J. A. Labra-Muñoz**, A. de Reuver, F. Koeleman, M. Huber, H. S. J. van der Zant. *Ferritin-based single-electron devices*. Biomolecules **12**, 132 (2022).
5. E. Vroegindewij, L. Bossoni, A. Boon, J. Wilson, M. Bulk, **J. Labra-Muñoz**, M. Huber, A. Webb, L. van der Weerd, J. Langendonk. *Quantification of different iron forms in the aceruloplasminemia brain to explore iron-related neurodegeneration*. NeuroImage: Clinical **30**, 102657 (2021).
4. D. Dulic, A. Rates, E. Castro, **J. Labra-Muñoz**, D. Aravena, A. Etcheverry-Berrios, D. Riba-Lopez, E. Ruiz, N. Aliaga-Alcalde, M. Soler, L. Echegoyen, H. S. J. van der Zant. *Single-Molecule Transport of Fullerene-Based Curcuminoids*. J. Phys. Chem. C. **124**, 2698 (2020).
3. **J. A. Labra Muñoz**, Z. Konstantinović, L. Balcells, A. Pomar, H.S.J van der Zant, D. Dulić. *Trapping and electrical characterization of single core/shell iron-based nanoparticles in self-aligned nanogaps*. Applied Physics Letters **115**, 063104 (2019).
2. D. Stefani, M. Perrin, C. Gutiérrez-Cerón, A. C. Aragonès, **J. A. Labra Muñoz**, R. D. C. Carasco, Y. Matsushita, Z. Futera, J. Labuta, T. H. Ngo, K. Ariga, I. Díez-Pérez, H. S. J. van der Zant, D. Dulić, J. P. Hill. *Mechanical Tuning of Through-Molecule Conductance in a Conjugated Calix[4]pyrrole*. Chemistry Select **3**, 6473 (2018).
1. D. Stefani, C. A. Gutiérrez-Cerón, D. Aravena, **J. A. Labra Muñoz**, C. Suarez, S. Lui, M. Soler, L. Echegoyen, H. S. J. van der Zant, D. Dulić. *Charge Transport through a Single Molecule of trans-1-bis-Diazofluorene [60]fullerene*. Chemistry of Materials **29**, 7305 (2017).