L10 - REPLACED

DISENTANGLING ANISOTROPY CONTRIBUTIONS IN MN-MIXED FERRITE NANOPARTICLES

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Tailoring magnetic nanoparticles (NPs) by choosing a suitable combination of size, shape, and material is the basis for realizing various technological (data storage, spintronics)[1], biomedical (magnetic hyperthermia, drug delivery)[2], or environmental applications. The macroscopic physical properties of magnetic NPs rely on magnetic anisotropy, and their understanding is fundamental to the design of magnetic materials for different applications. Nevertheless, magnetic anisotropy is influenced by the shape, crystal structure, surface effects, and interactions. To gain a comprehensive understanding of these properties, it is essential to investigate all the factors contributing to the total effective magnetic anisotropy. Conventional magnetic measurements like DC magnetization and AC susceptibility provide an overview of the macroscopic physical properties but do not reveal the detailed microscopic phenomena that drive these properties. This is where small-angle polarized neutron scattering (SANSPOL) comes into play, offering sub-atomic resolution and serving as a powerful tool for studying surface anisotropy[3] and microscopic phenomena.

In this contribution, we will show the impact of the Mn-doping level in cobalt ferrite NPs (10 nm) on their magnetic properties. Nevertheless, the macroscopic magnetic responses of the Mn-mixed cobalt ferrite NPs were inconclusive and inconsistent with changing Mn content. However, we will demonstrate the versatility of SANSPOL and disentangle all anisotropy contributions of the total magnetic anisotropy of a series of Mn-mixed Cobalt ferrite NPs with different Mn content but the same shape, size, and surfactant and correlate it with their macroscopic response[4]. Ultimately, our work aims to clarify the complicated picture of magnetic anisotropy and offer insights into the design of magnetic materials.

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SL9 - REPLACED

TEXTURAL ZONING OF PHENOCRYSTS AND GROUNDMASS IN DIKES OF PORPHYRITIC ROCKS

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Intrusive rocks provide a unique opportunity to study the mechanisms of spatial movement and crystallization of magma in individual stages of development. Intrusive porphyry rocks support additional information about the evolution and conditions of crystallization taking place in the deep development of the parental magma that is contained in the zoning of the feldspar phenocrysts. The knowledge obtained may provide a key to the interpretation of complex magmatic systems with a significantly more complicated history. This thesis utilizes petrological and mineralogical methods to study three different dike systems in the western part of the Bohemian Massif. Quantitative textural analysis, X-ray powder diffraction and microanalytical methods are used to study granite, syenite and diorite porphyry and their K-feldspar and plagioclase phenocrysts. Textural records of the porphyry rocks of the three dike systems and crystallographic-chemical records of their feldspar phenocrysts suggest a mechanical flow accumulation taking place within the dike at all three locations, but with different characteristics of magma flow rheology. The records also suggest different deep developments and crystallization conditions of the parent magmas of the studied dike systems.

L12 - REPLACED

THE EFFECT OF ARRHYTHMIA-ASSOCIATED MUTATIONS ON THE FOLDING, STABILITY AND DYNAMICS OF THE N-TERMINAL DOMAIN OF THE HUMAN CARDIAC RYANODINE RECEPTOR 2

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Ryanodine receptors (RyRs) are large multidomain homotetramers (Mr ? 3.2 MDa) which are embedded in the membrane of the sarcoplasmic reticulum (SR). Their main physiological function is to release Ca2+ from the SR into the cytoplasm of myocytes, which triggers a cascade of reactions resulting in muscle contraction. Isoform 2 of this receptor is predominantly present in the heart and its dysfunction triggers certain types of arrhythmias (CPVT1, ARVC/D2, syncopes of unknown origin, SIDS). RyR2 dysfunction is often caused by inheritable missense mutations which occur in the gene of this protein. Mutations often affect the oligomeric state of individual domains, their biophysical properties, their dynamics, or their interactions with neighboring domains. These changes alter the opening and closing of the channel.

In our study we focused on the biophysical, biochemical and molecular dynamics characterization of the hRyR2 N-terminal domain (NTD) in its native form and its L433P mutant form, which is associated with CPVT1 and ARVC/D2 [1, 2]. The crystal structure of the hRyR2 NTD in its native form was determined in our laboratory [3]. CD spectroscopy revealed that, although the L433P variant maintains an ?+ß fold, the L433P mutation increases its ?-helical content by 10%. FIDA and SEC analysis showed that the L433P mutation caused an increase in oligomeric formation by the hRyR2 NTD in comparison to the wild-type form. NanoDSF experiments showed that the L433P mutation does not influence the hRyR2 NTD thermal stability. Pilot molecular dynamics experiments suggest that the L433P mutation causes the unwinding of the C-terminal part of the central helix.

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