Contribution ID: **53**   Type: **Poster**

Magnetic protein separation with new affinity tags for bare iron oxide nanoparticles

Monday, 17 September 2018 17:45 (15 minutes)

The need for pharmaceuticals based on therapeutic proteins is increasing for many years. Here, the purification is the most cost-intensive step during the production of therapeutic proteins which leads to remarkable potentials in the improvement of common techniques. Besides adaption of purification resin, affinity tags can be used to selectively separate target proteins from contaminations. Commonly, such affinity peptide sequences only bind selectively to expensive surface modifications. Therefore, we design highly affine peptides, utilized as tags for magnetite nanoparticles.

Magnetite nanoparticles are synthesized with a co-precipitation route and used for protein purification without further modifications.

A glutamate tag is used as affinity sequence in a green fluorescent protein (GFP). High loads of GFP on the magnetite nanoparticles can be reached at different buffer conditions which can be verified by fluorescence analysis. However, the binding of the glutamate tag to the nanoparticles is reversible.

The colloidal behavior of the nanoparticles and their interaction with the proteins is investigated with small angle neutron scattering. Here, we are able to observe small aggregates of around 4 primary particles which tend to agglomerate when exposed to proteins and E. coli fermentation broths. However, this agglomeration does not affect the binding capacity while aiding the magnetic separation of nanoparticles. Thus, the developed particle-tag system can be up-scaled.

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Session Classification: Poster session 1

Track Classification: P6 Nanomaterials and nanostructures