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# Inelastic magnetic scattering and hydrogen dynamics in H3O-Jarosite

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The mineral jarosite KFe3(OH)6(SO4)2 is a frustrated antiferromagnet. It exhibits long range magnetic order (LRO), when cooled below TN = 60 K, due to DM interaction. The mineral is a classic example of a 2D geometric frustration Kagome lattice. It has earlier been discovered that a substitution of H3O or D3O for K on the A-site prevents LRO. Instead, a spin glass transition sets in at Tg = 14 K. In contrast, substitution with NH4 (or ND4) only suppresses TN slightly.

The objective is to understand the mechanics behind this selective suppression of LRO, which is yet to be understood. It has been hypothesized that H-disorder and/or H-dynamics could play a role in this effect. Moreover, Fe vacancies may lift the geometrical frustration locally.
Thus, we performed inelastic neutron scattering experiments on powders of D3O-, H3O-, and ND4-jarosite to investigate the magnetic dynamics and hydrogen dynamics to understand the lack of LRO in H3O/D3O jarosite. The samples were characterized by 2H MAS to assess sample purity especially defect concentration and substitution on the A site. By comparing data from susceptibility, MAS-NMR and inelastic neutron scattering we aim to unveil the mechanics behind the glass transitions in H3O/D3O jarosite.

**Primary author:** MACHUCA-BEIER, Lukas (Copenhagen University)

**Co-authors:** Dr STEEN PEDERSEN, Kasper (DTU); Prof. LEFMANN, Kim (KU); Ms BORUP SØRENSEN, Mathilde (KU); Mr NIELS NEERUP ANDERSEN, Nikolaj (SDU); Prof. DEEN, Pascale (KU); Ms LIU, Peiyuan (KU); Dr JANAS, Sofie (DTU); Dr HOLM-DAHLIN, Sonja (KU); Prof. GRO NEILSEN, Ulla (SDU); Mr GYANU YOGI, Unique (KU)

**Presenter:** MACHUCA-BEIER, Lukas (Copenhagen University)

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