Experimental report

12/02/2021

Proposal: 6-05-1019 **Council:** 4/2020

Title: Neutron scattering experiment on non-linear optical materials

Research area: Other...

This proposal is a new proposal

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Experimental team:

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Samples: [(PhSn)4S6], Ph=Phenyl (C6H5)
[(NpSn)4S6], Np=Naphtyl (C10H7)
[(CpSn)4S6], Cp=Cyclopentadienyl (C5H5)
[(MeSn)4S6], Me=Methyl (CH3)

Instrument	Requested days	Allocated days	From	To
D4	2	2	28/08/2020	30/08/2020

Abstract:

Recently a new class of molecular materials has been found which exhibits strong non-linear optical effects: Irradiating the sample with a low power IR Laser produces a broad and continuous light spectrum covering the visible regime. This emitted white light is highly directional and has a brilliance comparable to a Laser. The origin of this effect is, as of yet, unknown. This White-Light Emission (WLE) only occurs in amorphous samples while in a crystalline state these materials exhibit the well known Second Harmonics Generation (SHG) effect. These observations suggest that the WLE effect is linked to the amorphous structure. We propose neutron diffraction experiments to gain information on the structural cause of the WLE effect.

Preliminary experimental report

The background corrected data from this remote experiment is shown in figure 1 while the result of a first data correction is shown in figure 2. The synthesis of the deuterated samples was troublesome (massively delayed delivery of deuterated chemicals due to corona crisis), so that only 2 out of the planned amount of 4 samples were ready for the experiment. As can be seen in the data there was a lot of hydrogen left within the samples. The additional time from having only two samples allowed for longer measurements so that the quality of the data is good enough to see clear oscillations. Therefore the determination of a structure factor is possible despite the strong incoherent background. With these data our information density regarding the organic side groups of the molecules skyrocketed which is mandatory for a complete characterization of the amorphous structure.

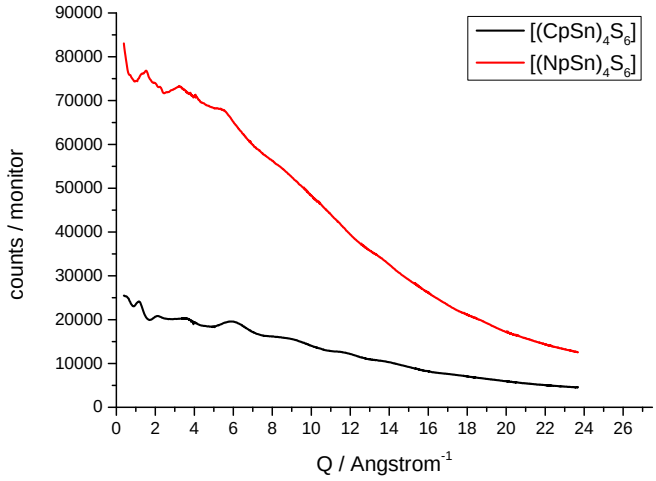

Figure 1: Background corrected data.

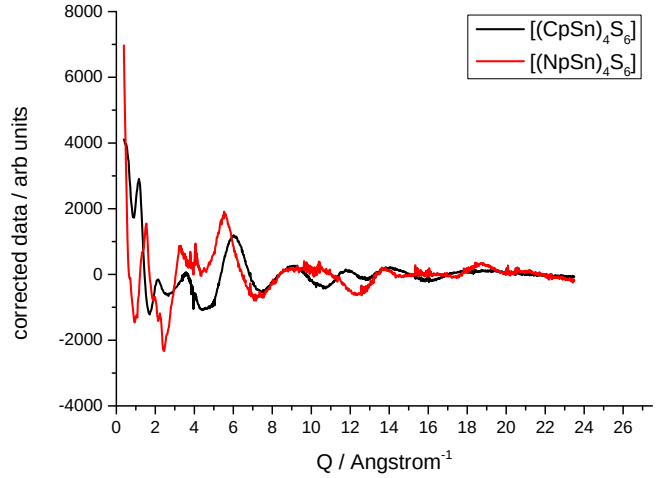

Figure 2: Preliminary data correction.