

Posudek práce

předložené na Matematicko-fyzikální fakultě
Univerzity Karlovy

- posudek vedoucího posudek oponenta
 bakalářské práce diplomové práce

Autor/ka: **Andrej Kancko**

Název práce: **The search for new spin-liquid materials – synthesis of pyrochlore and kagome fluoride magnets**

Studijní program a obor: **Fyzika kondenzovaných soustav a materiálů (N0533A110016)**

Rok odevzdání: **2022**

Jméno a tituly vedoucího/opponenta: **Ross Harvey Colman, Dr.**

Pracoviště: **Dept. Condensed Matter Physics [KFKL]**

Kontaktní e-mail: **ross.colman@mag.mff.cuni.cz**

Odborná úroveň práce:

- vynikající velmi dobrá průměrná podprůměrná nevyhovující

Věcné chyby:

- téměř žádné vzhledem k rozsahu přiměřený počet méně podstatné četné závažné

Výsledky:

- originální původní i převzaté netriviální kompilace citované z literatury opsané

Rozsah práce:

- veliký standardní dostatečný nedostatečný

Grafická, jazyková a formální úroveň:

- vynikající velmi dobrá průměrná podprůměrná nevyhovující

Tiskové chyby:

- téměř žádné vzhledem k rozsahu a tématu přiměřený počet četné

Celková úroveň práce:

- vynikající velmi dobrá průměrná podprůměrná nevyhovující

Slovní vyjádření, komentáře a připomínky vedoucího/opponenta:

The presented work is an experimental investigation, describing the synthesis, single crystal growth and material characterisation of a series of new pyrochlore fluoride compounds.

The student presents an extended initial introduction, covering a description of the basics of magnetism, magnetic interactions and magnetic groundstates that frame the characterisational work.

He then describes the wide variety of experimental techniques used during the project. The third chapter gives a reasonable literature review of the currently studied materials in this field, setting up the arguments for the studies performed as part of this project.

The results chapter starts with a clear justification of the chosen compositions, based on pyrochlore structure tolerance factors and appropriate considerations of tabulated ion sizes. A number of compounds were studied in detail, some of which requiring extensive testing of synthesis parameters. Most of the studied compounds were investigated as polycrystalline materials, although single crystals were also prepared towards the end of the project. The results include the use of multiple characterisation tools, such as: powder diffraction, ac- and dc-magnetometry, and heat capacity.

The discussion collects the results of the 6 successfully synthesised pyrochlore fluorides, and attempts to rationalise the observed properties based on both the structural analysis and understanding of the magnetic ion local environments – in relation to the previously published data. The student shows that the lattice parameters follow a published theoretical expectation through the series, and fall in line with the other published compounds.

These additional studies will clearly be important for the field and are expected to be published in peer reviewed journals.

The figures are nicely presented and clear, with consistent formatting. The tables are also well considered and clear, and the work includes 108 references, primarily to peer reviewed journal articles as well as a number of consulted text books or software package manuals.

The English is of an excellent level with minimal typos and grammatical errors.

Případné otázky při obhajobě a náměty do diskuze:

1. Most of these materials were prepared and characterised initially as polycrystalline powders. The successful preparation of single crystals was mentioned in the later stages of the project though. What additional information would the study of the single crystals give you?
2. What additional characterisation techniques have been used to further probe and characterise the ground-states in this family of materials, and are they applicable to your series?
3. The Cd in the compounds prevents the easy investigation by neutron diffraction. Is there a way to possibly overcome this issue?

Práci

doporučuji

nedoporučuji

uznat jako diplomovou/bakalářskou.

Navrhuji hodnocení stupněm:

výborně velmi dobře dobře neprospěl/a

Místo, datum a podpis vedoucího/opponenta:

01.06.2022

Dr. Ross H. Colman
Ke Karlovu 3