63rd ANNUAL CONFERENCE OF THE SA INSTITUTE OF PHYSICS



Contribution ID: 195

Type: Poster Presentation

Crystal structure and thermodynamic properties of the non-centrosymmetric PrRu₄Sn₆ caged compound

Tuesday, 26 June 2018 15:00 (2 hours)

PrRu₄Sn₆ is a tetragonal, non-centrosymmetric structure compound [1]. It is isostructural to the extensively studied Kondo insulator CeRu₄Sn₆ [2, 3, 4] which crystallizes in the YRu₄Sn₆-type structure with space group <i>I</i>-42<i>m</i>. In this structure, the Pr atom fills the void formed by the octahedral Ru₄Sn₆ units which results in a tetragonal body centered arrangement [1, 5]. Here we present the physical and magnetic properties of PrRu₄Sn₆. The specific heat, <i>C_p</i>(<i>T</i>), electrical resistivity, &rho(<i>T</i>) and magnetic susceptibility, &chi(<i>T</i>) results collected between 300 K and 2 K do not show any phase transition in the temperature range. &chi(<i>T</i>) follows Curie-Weiss behavior above 100 K with effective magnetic moment, &mu_{eff} = 3.34 &mu_B/Pr which is close to the expected free ion value of 3.58 &mu_B/Pr and paramagnetic Weiss temperature, &theta_p = -19.47 K indicating a dominant antiferromagnetic interaction. The magnetization, <i>M</i>(<i>H</i>) at 2 K is quasi-linear in nature and attains a value of 0.86 &mu_B/Pr at 7 T which is well reduced compared to the free ion saturation moment of 3.32 &mu_B/Pr possibly due to magnetocrystalline anisotropy in the polycrystalline sample. The low-temperature analysis of <i>C_p</i>(<i>T</i>) gives a Sommerfeld coefficient, & gamma = 38.60 mJ/(K²2/sup>2/smol). &rho(<i>T</i>) follows a typical metallic behavior down to low-temperatures in contrast to the semimetallic behavior observed in CeRu₄Sn₆. The thermal conductivity, &kappa of PrRu₄Sn₆ shows a glassy behavior above 30 K possibly due to the interactions of the low-frequency "rattling" vibrations of the guest atom with the acoustic phonons of the host lattice resulting in heat dissipation.

Please confirm that you
have carefully read the
abstract submission instructions
under the menu item
"Call for Abstracts"
<b/(Yes / No)

Yes

Consideration for
student awards
Choose one option
from those below.
N/A
Hons
MSc
PhD

PhD

Supervisor details
If not a student, type N/A.
Student abstract submision
requires supervisor permission:
please give their name,
institution and email address.

Prof. AM Strydom, University of Johannesburg, amstrydom@uj.ac.za

Primary authors: Prof. STRYDOM, Andre (University of Johannesburg); Mr OGUNBUNMI, Michael (University of Johannesburg)

Presenter: Mr OGUNBUNMI, Michael (University of Johannesburg)

Session Classification: Poster Session 1

Track Classification: Track A - Physics of Condensed Matter and Materials