

Experiment Report Form



	Experiment title: Free Electron to Electride Transition in Liquid and fcc Potassium	Experiment number: HC-5084
Beamline: ID27	Date of experiment: from: 24 Feb 2023 to: 28 Feb 2023	Date of report: 2023-09-11
Shifts: 12	Local contact(s): T. Poreba, M. Mezouar	<i>Received at ESRF:</i>
Names and affiliations of applicants (* indicates experimentalists): School of Physics and Astronomy, The University of Edinburgh, Peter Guthrie Tait Road, EH9 3FD Edinburgh, UK: C. Storm*, M. McMahon*, J. McHardy*, M. Duff*, and S. MacLeod		

Report:

The aim of the experiment was to examine the compressibility of K in both the liquid and solid *fcc* phase, investigating changes in the bulk modulus which have been calculated by Refs. [1], [2]. The bulk modulus in the bcc and fcc phase is shown in Fig. 1, highlighting the drastic change in compressibility between the phases, in good agreement with the theoretical studies. Analysis of the liquid phase is proving more difficult, in particular extracting the compressibility in this region. This work is still ongoing.

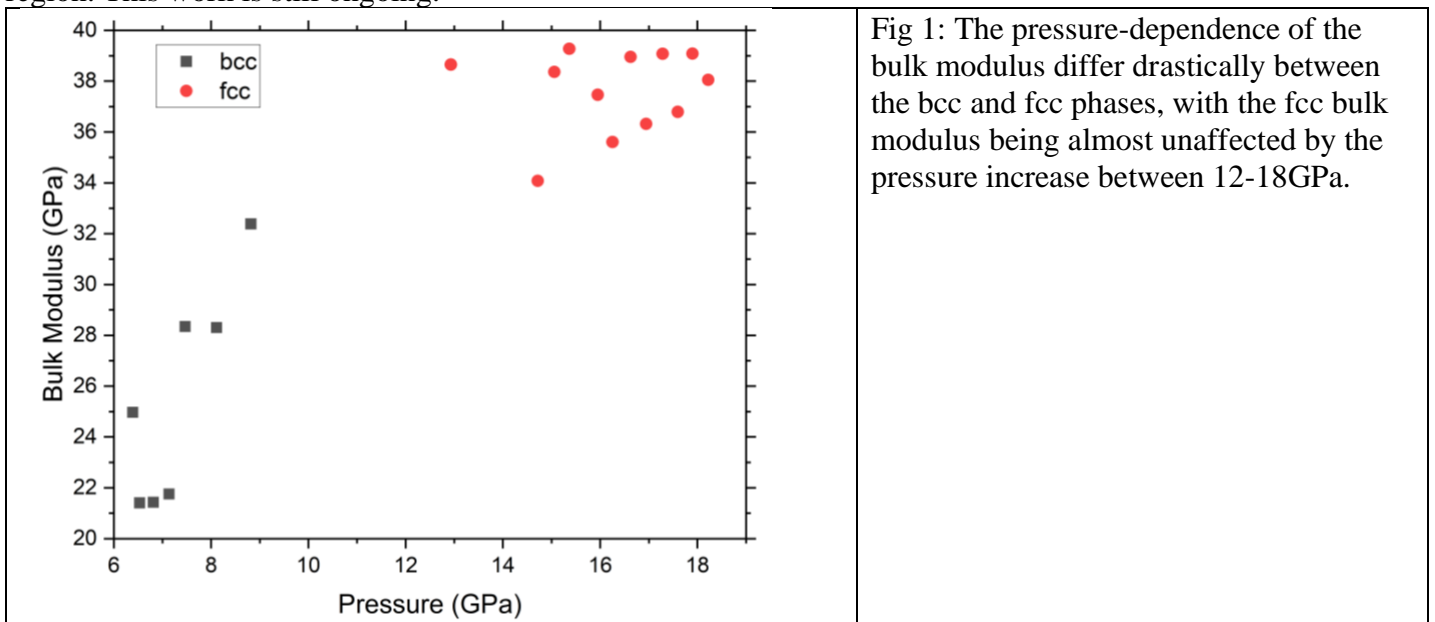


Fig 1: The pressure-dependence of the bulk modulus differ drastically between the bcc and fcc phases, with the fcc bulk modulus being almost unaffected by the pressure increase between 12-18GPa.

References:

- [1] L. Zhao, H. Zong, X. Ding, J. Sun, and G. J. Ackland, ‘Anomalous thermophysical properties and electrone transition in fcc potassium’, *Phys Rev B*, vol. 104, no. 10, p. 104107, Sep. 2021, doi: 10.1103/physrevb.104.104107.
- [2] H. Zong *et al.*, ‘Free electron to electrone transition in dense liquid potassium’, *Nat Phys*, vol. 17, no. 8, pp. 955–960, Aug. 2021, doi: 10.1038/s41567-021-01244-w.