

The neutron-scattering amplitude of potassium

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The publication of a precision value for the coherent neutron-scattering amplitude of chlorine by KOESTER (1967) provides an encouraging starting point for a redetermination of the scattering amplitudes of certain other elements. Many of these have remained largely unquestioned since they were first determined in the pioneer researches of SHULL and WOLLAN (1951) who suggested that their values might be correct to 3 or 4 per cent. A typical example is potassium for which b was quoted at 0.35×10^{-12} cm. More recently BROWN and WALKER (1966), in a single-crystal study of K_2NbF_7 , have deduced a value of $0.370 \pm .004$ for potassium on the basis of the value 0.55 for fluorine.

We ourselves have redetermined the value for potassium in the original manner, from the powder diffraction intensities of KCl followed by an extrapolation to a scattering angle of zero for the structure-amplitude factors of odd and even-indexed reflections. Six independent sets of data have been collected, using three different spectrometers: in most cases reflections up to 422 and 311 have been used but in two cases 642 and 333 were also measured. Counting times were made sufficiently long to limit the standard error for each reflection to one per cent. Our final result for potassium, based on KOESTER's value of 0.963×10^{-12} cm for chlorine, is $0.369 \pm .003 \times 10^{-12}$ cm. This is in good agreement with BROWN and WALKER's value and may provide further justification for their assumption of 0.55 as the appropriate value for fluorine.

We would encourage other workers to carry out and present similar measurements on simple substances in order to build up a more substantial list of refined data of nuclear scattering amplitudes for neutrons.

References

- G. M. BROWN and L. A. WALKER (1966), Refinement of the structure of potassium heptafluoroniobate, K_2NbF_7 , from neutron-diffraction data. *Acta Crystallogr.* **20**, 220–229.
- L. KOESTER (1967), Absolutmessung der kohärenten Streulängen von Wasserstoff, Kohlenstoff und Chlor sowie Bestimmung der Schwerebeschleunigung für freie Neutronen. *Z. Physik* **198**, 187–200.
- C. G. SHULL and E. O. WOLLAN (1951), Coherent scattering amplitudes as determined by neutron diffraction. *Physic. Rev.* **81**, 527–535.