

Thermal Neutron Scattering Data

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History

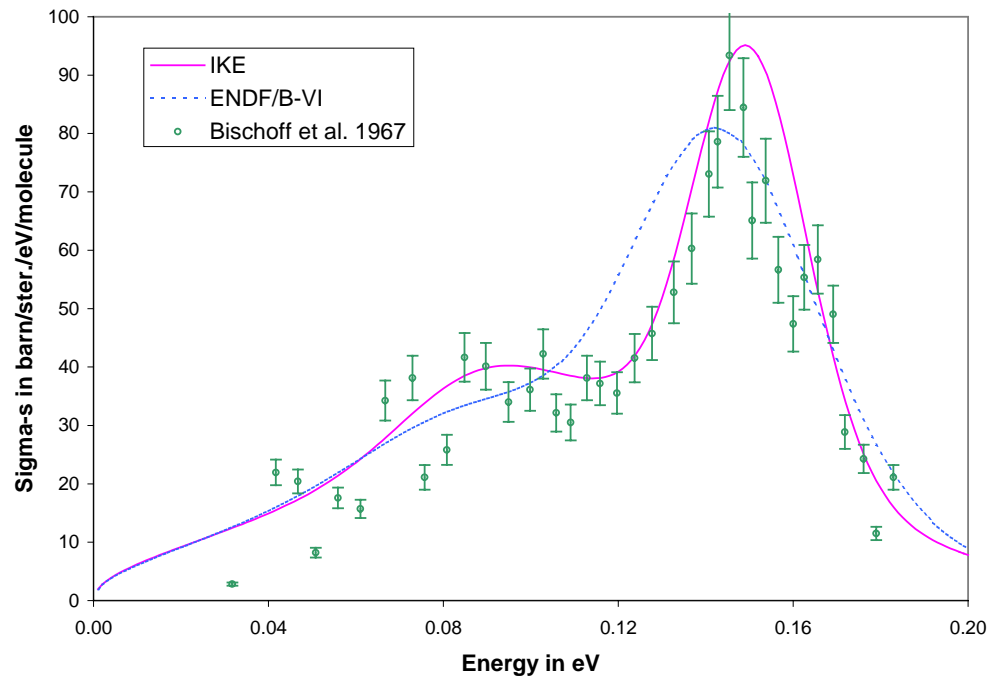
- Original thermal scattering $S(\alpha, \beta)$ evaluations were done by GA in the late sixties.
- The formats were updated for ENDF/B-VI, but the evaluations were simply converted.
- Many materials were upgraded for Release 3 using NJOY with similar models but more accurate calculations.
- Some additional cold-moderator materials were added (e.g., ortho- and para-hydrogen).

Recent Work

- New evaluations for Al and Fe done for cold-moderator work at Los Alamos.
- New evaluation for H(H₂O), H(ZrH), and D(D₂O) done at U. Stuttgart (Mattes) using updated physics representations and finer grids. Finer grids may be important for TRIGA reactors.
- Code comparisons for thermal scattering organized by Red Cullen, showing substantial variation between different codes.
- Possible problems in coherent scattering for some forms of graphite observed by Bowman.

Mattes H(H₂O)

Double differential neutron scattering cross section of water (H₂O) around room temperature
for E = 154 meV and angle of 60°



Mattes H(H₂O)

- Processed with NJOY after making modifications to handle the big file.
- Tested on several thermal cases:

Case	Regular	Mattes
LCT6-6	.99907(26)	.99890(26)
HST42-7	1.00061(14)	1.00017(15)

Conclusions

- The current thermal data seem to work reasonably well. Improvements from new evaluations are probably modest, but more detailed processing might be needed.
- Work on reducing the variation between different codes using the same basic data needs to continue before we can make good conclusions on the quality of the data from criticality results.