Advanced Fuel Cycle Measured Data Needs

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August 11, 2006

Through its Physics Working Group, the AFCI has developed a list of measurement data needs

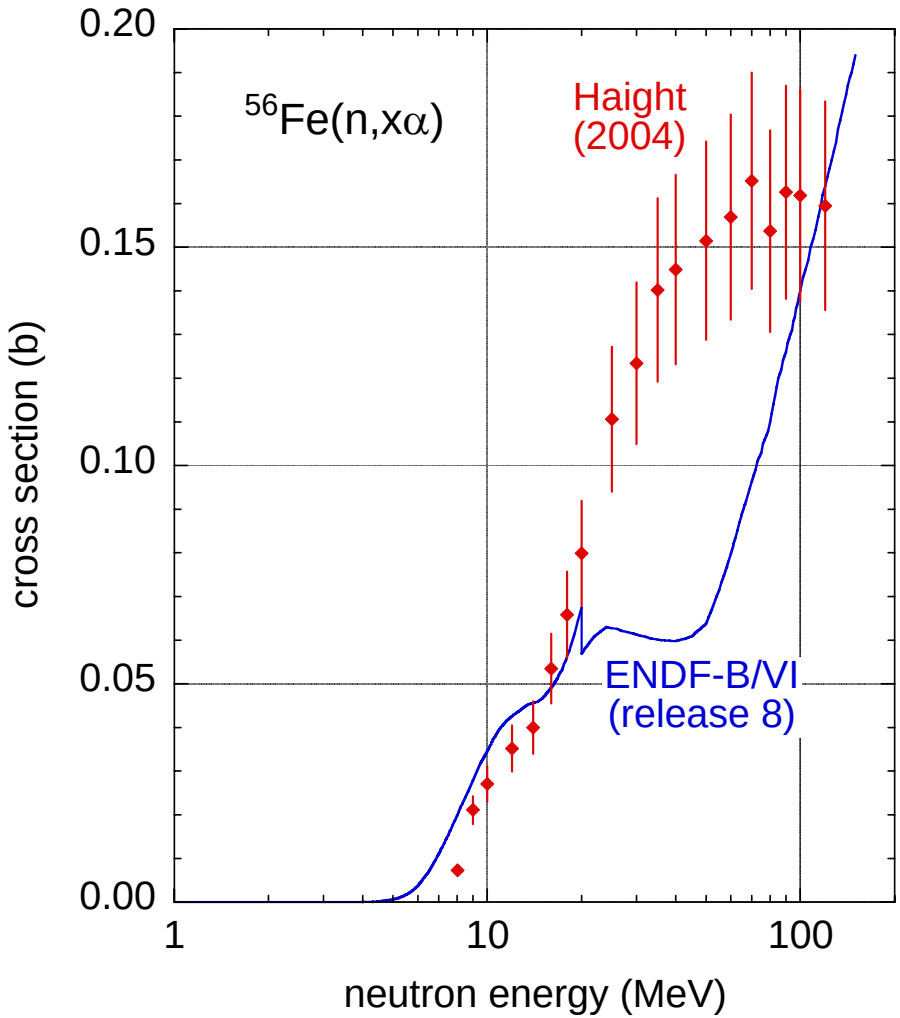
- Neutron cross sections
  - actinide fission (242Pu, 240Pu, 241Pu in FY06-07)
  - actinide capture (240Pu, 241Pu in FY06-07)
  - gas production: (n,xp) and (n,xα)
  - Inelastic (23Na and 56Fe)
- Safeguards and Materials Accountability applications
  - P(ν,E)
  - (γ,f), (γ,n)
  - β, β(E)

Sensitivity studies show how nuclear data uncertainties impact transmutation performance

- Generalized Perturbation Theory used to calculate the sensitivity of parameters of interest (e.g., criticality, reactivity coefficients, reactivity loss with burnup, etc.) on uncertainties in nuclear data *for representative systems*
- Input needed from experimenters on:
  - The “cost” of achieving measured target accuracies
  - The best achievable accuracies
- This process is used to define the high-priority cross section measurement needs

The lifetimes of structural components in fast reactors can be limited by He production

- These cross sections are very difficult for evaluators to predict without experimental data to guide them
- We have measured neutron-induced H and He production for structural materials from threshold to 100 MeV
- Measurements of Fe, Ni, Cr, Ta are complete
- Currently measuring Mo
- Data beyond the fast reactor spectrum limit of 10 MeV are important for MTS



Beyond fission and capture measurements

- Sensitivity analyses have shown improvements are needed for
  - Inelastic cross sections (23Na and 56Fe)
  - Actinide (n,2n)
- Better characterization of the fission process in MA
  - Fission product yields
  - Prompt energy release
  - Decay heat

Safeguards and Materials Accountability applications may require better nuclear data

- Novel forms of process streams in spent fuel reprocessing facilities and transmutation fuel fabrication plants, and the desire to achieve greater accuracy than that which exists today may drive the need to better nuclear data:
  - (γ,f), (γ,n)
  - Neutron multiplicity ν and energy distribution ν(E)
  - Delayed neutron fraction β and energy distribution β(E)
- An assessment of needed accuracies must be completed prior to funding an experimental program