Supracumulative cross section

(N. Otsuka, 2022-02-14, Memo CP-D/1042)

This paper seeks an approval to revision of the description of the "supracumulative cross section".

The range of the coefficient *a* is limited between 0 and 1 in the table of the LEXFOR chapter approved in NRDC 2019 C19 (WP2019-29). We found it can be larger than 1, and it could require further revision of the table (still an open question).

LEXFOR "Independent and Cumulative Data" introduces the "supracumulative cross section" in the following paragraph:

Supracumulative Cross Section
This term is sometimes used for the situation that the observed cross section is bigger than the 'actual' cumulative cross section because production of the measured nuclide continues after the end of irradiation. Many relevant publications do not make this distinction and no special EXFOR code for it exists so far; if such data are compiled, explanation in free text is needed.

See e.g., Yu.E. Titarenko et al., Phys. Rev. C65(2002)064610, and INDC(CCP)-434, pp. 7-15 (2003).

I suggest addition a few equations to define the supracumulative cross section more clearly.

Supracumulative Cross Section
This term is sometimes used for the situation that the observed cross section is bigger than the 'actual' cumulative cross section because production of the measured nuclide continues after the end of irradiation. The supracumulative cross section determined by the ground state activity measured after complete decay of the metastable state is $\sigma_{dir}(^{Ag}J)+ a\ \sigma_{dir}(^{Am}J)$ with $a= f\ \lambda_m/(\lambda_m-\lambda_g)$ when $\lambda_g < \lambda_m$ and there is no precursor nuclide (*f*: isomeric transition probability). It approximate the 'actual' cumulative cross section when $\sigma_{dir}(^{Ag}J) >> f\ \sigma_{dir}(^{Am}J)$ or $\lambda_g << \lambda_m$. Many relevant publications do not make this distinction and no special EXFOR code for it exists so far; if such data are compiled, explanation in free text is needed.

See e.g., Yu.E. Titarenko et al., Phys. Rev. C65(2002)064610, and INDC(CCP)-434, pp. 7-15 (2003).

Two remarks:

- This implies the coefficient *a* defined in LEXFOR can be larger than 1 because of the factor $\lambda_m/(\lambda_m-\lambda_g)$.
- Titarenko et al. mentions in the Phys. Rev. C article that the supracumulative cross section approximates 'actual' cumulative cross section when $\sigma_2^{ind} << \sigma_1^{cum}\nu_1$, but I believe the inequality symbol must be opposite.