Duplication in Proton Activation Cross Sections Measured by Michel's Group

(N. Otsuka, 2013-04-28, extraction from CP-D/805 with update)

The experimental group led by Prof. Rolf Michel (Uni. Hannover) has measured intermediate (10 MeV -) to high energy (- 2.6 GeV) proton-induced activation cross sections to understand isotope production in meteorites by cosmic-ray irradiation. These data were tabulated in progress report (INDC(GER)=NEANDC(E)) and journal articles, and compiled by CAJaD and NEA DB. Irradiations were sometimes performed for both thin and thick (mock up of meteorites), and the latter data have been utilised to validate both proton- and neutron-induced reaction cross section data determined by his group, too.

NDS has been informed several times that same or similar cross section data are seen in EXFOR entries for these cross sections. NDS detected more than **1200** suspicious data points, and analysed them with **35** articles. Necessary actions are summarized in **Table 1**.

Because irradiation at some proton energy was repeated several times, the distinction of duplication for superseding or deletion was not a trivial task. Fortunately Prof. Michel visited IAEA at the beginning of September, and provided NDS a lot of useful information for improvement of these EXFOR entries. Such detailed information and information on each data point are given in **Appendix 1 and 2** of this memo.

Table 2 compares all "valid" EXFOR data points with a data file prepared independently by the Hannover group (MI_95.sig). This may indicate that the originating data centres also must check if all necessary data points are compiled in EXFOR.

Note that MI_95.sig distinguishes cumulative and independent for ^{3}He, ^{22}Ne, ^{57}Co, ^{83}Rb and ^{87}Y, and existence of CUM or IND in the corresponding EXFOR data sets must be checked.

Table 1: Summary of actions for CAJaD and NEA DB

When two data points from two different irradiations are in two subentries, they must be cross referenced by STATUS=COREL. If data points published in an article are not compiled in the entry created from the article, it must be indicated by REL-REF=O.

EXFOR	Remark
A0100	Adopt MI_96.sig data for Ti, Fe, Ni data with citation to [8].
A0145	Delete 004. Te same data set is compiled in A0148.005.
A0146	Ok
A0344	Supersede data from [11] by O0078, O0104 or O0280.
A0432	Delete all. Repetition of O0278.
A0435	Supersede all data by O0277.
A0478	Supersede all data mainly by O0277.
A0479	Supersede all data by O0277 or O0281.
A0481	Supersede all data by O0277.

A0516	Delete all (repetition of O0276, O0277 or O0505) except for some data which must be superseded.
A0518	Delete all. Repetition of O0276 or O0282 except for a few data points.
A0519	Delete all (repetition of O0277) except for some data which must be superseded.
A0529	Delete all. All data were digitized, and final data are compiled in A0517.
A0530	Delete all. All data were digitized, and final data are compiled in O0276 or O0282.
B0083	Ok
B0100	Ok
O0078	$^{59}Co(p,x)^{54}Mn$ cross section must be added.→ ***Done in TRANS.O051!***
O0080	Delete all. All data were digitized, and final data are compiled in O0078 or O0281. → ***Done in TRANS.O051!***
O0088	Ok
O0098	Supersede all data mainly by O0276 or O0277. → ***Done in TRANS.O051!***
O0104	Ok
O0276	Some $Ca(p,x)^{47}Ca$ and $Mg(p,x)^{10}Be$ (A0518.004) data must be added from MI_96.sig. ***Done in TRANS.O051 only for ^{10}Be production?***
O0277	Check if all 1.2 and 2.6 GeV data in MI_96.sig are given. Two data points can be at same Ep.
O0278	Ok
O0279	Delete Ba(p,x)127Xe data at 0.8, 1.2 and 2.6 GeV which are repeated in O0276.351. . → ***Done in TRANS.O051!***
O0280	Delete 020 and 021which are repeated in O0078.003.2 and O0078.005.2. . → ***Done in TRANS.O051!***
O0281	Supersede 800, 1200 and 2600 MeV data by O0277.
O0282	Delete C,N,O,Si(p,x)^{10}Be data (015-017,019) which are repeated in O0276. . → ***Done in TRANS.O051!***
O0284	Ok
O0505	Ok

Table 2: Comparison between the Hannover database (MI_96.sig) and EXFOR

Hannover database (MI_96.sig)				EXFOR	
Ref	Author	Reference	pts	entry	pts
WE75	H.Weigel+	J,RRL,21,293,1975	31	O0080	30
MI78	R.Michel+	J,JIN,40,1845,1978	156	B0100	156
MI78A	R.Michel+	J,ZP/A,286,393,1978	288	B0083	144
MI79A	R.Michel+	P,INDC(GER)-21,68,1979	51	A0145	149
MI80	R.Michel+	J,JRC,59,467,1980	115		
MI79	R.Michel+	J,NP/A,322,40,1979	323	A0146	385
PR80	K.Prescher+	P,INDC(GER)-22,50,1980	32		
MI83	R.Michel+	J,JGR/B,89,673,1984	913	A0100	1538
MI84	R.Michel+	P,INDC(GER)-27,32,1984	97		
MI85	R.Michel+	J,NP/A,441,617,1985	692		

MI89	R.Michel+	J,ANA,114,287,1989	189	O0078	198
MI89A	R.Michel+	J,NIM/B,42,76,1989	18	O0280	20
DI90A	B.Dittrich+	J,NIM/B,52,588,1990	83	O0281	76
PR91	K.Prescher+	J,NIM/B,53,105,1991	321	O0278	340
BO93	R.Bodemann+	J,NIM/B,82,9,1993	327	O0282	352
MA94	K.J.Mathews+	J,NIM/B,94,449,1994	42	O0279	45
MI95	R.Michel+	J,NIM/B,103,183,1995	677	O0277	693
SC96	Th.Schiekel+	J,NIM/B,114,91,1996	1303	O0284	1096
MI96	R.Michel+	J,NIM/B,129,153,1997	10389	O0276	10032
Total			**16047**		**15254**

All necessary corrections will be done by CAJaD and NEA DB.

In this occasion, NDS checked **alpha**-induced activation cross sections, and found some suspicious pairs. Based on the comments from Prof. Michel, NDS made the following conclusions:

- **A0529**: **Delete**. All are digitized preliminary data from C,91JUELIC,,745,1991 which final data are in **A0517** from H.J.Lange+, J,ARI,46,93,1995.

- **A0153**: Data are taken from Brinkmann's thesis, which are independent from A0517.013-014 compiled from H.J-Lange+, J,ARI,46,93,1995.

- **A0145.004: Delete.** The same data table was compiled from two articles (J,JRC,59,467,1980 and J,RCA,32,173,1983) in A0145.004 and A0148.005. Prof. Michel asks to cite the RCA article.

Addition for WP2014-26:
The data sets compiled in MI_96.sig were recently reviewed with R. Michel, and published as INDC(GER)-0052.