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Analysis of Optical Model Parameters for S-32 by Using ABAREX and SCAT2

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Abstract

Theoretical studies of systematic of the dependence of optical potential parameters on the neutron–nucleus scattering cross sections for S-32. Complex spherical potential is found to be very useful to calculate neutron scattering cross sections. There are Global parameters as well as Local parameters for almost all known nuclides proposed by some well-known theoretical nuclear physicists. We have evaluated a local parameter set for S-32, and it is found that the calculated neutron total cross sections using it are in better agreement with experimental results than Koning results, SCAT-2 results and ABAREX default results. Our evaluated optical model parameters can be used as local optical model parameter set for S-32, and the result may be useful for the development of a global parameter set which will be useful for all nuclides.

Key words: Neutron Cross-sections, Optical Model Parameters, Nuclear Code, ABAREX, SCAT2

Introduction

Nuclear cross-section data are needed for scientific works as well as for reactor construction. Nuclear cross-section data are provided by experimental works. Nuclear experiments are very expensive, so model calculations are used to predict cross-sections. Various nuclear codes are developed to calculate nuclear cross-sections. Not all the codes are perfect and we have to find correction factors. Generally, nuclear cross-sections depend on target mass, incident energy and type of incident particle.

We have attempted to study the role physical pictures play in optical model potential parameters by using the IAEA nuclear codes ‘SCAT2’ and 'ABAREX' formally acquired under Computational Nuclear Physics programme of the IAEA TC project Mya/01/013 Applied Nuclear Physics and Nuclear Instrumentation.

In this work, we have studied the dependence of optical potential parameters on the neutron-nucleus scattering cross sections for S-32. We have evaluated the best optical parameter set for it, and compared the results with those given in JENDL4.0 and TENDL.

The Optical Model Potential

The spherical optical model was employed in the statistical-model and ABAREX calculation. The neutron potential parameters were taken from a Japanese compilation in the JENDL4.0. The parameters were adjusted to agree with those of experimental data. The best-fit parameters were obtained by analyzing the total cross sections.

The optical model potential can be used to calculate the differential cross-section for the elastic scattering of nucleons by nuclei making use of the quantum mechanical scattering formalism. This calculation gives only the direct elastic scattering so the comparison with the experimental cross-section must only be made at energy high enough for the compound elastic cross-section to be negligible.

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The potential experienced by a particle incident on a nucleus is the extension to positive energy of the shell-model potential for bound nucleons. The full optical potential is

$$
\begin{array}{ll}
U_{opt}(r) = & \\
+V_C(r) & \text{a Coulomb term,} \\
-V\,f_V(r) & \text{a real volume term,} \\
+V_s g_V(r) & \text{a real surface term,} \\
-iW_s\,g_W(r) & \text{an imaginary surface term,} \\
-iW_v\,f_W(r) & \text{an imaginary volume term,} \\
-d_{so}\,\vec{l}\cdot\vec{s}\,V_{so}\,h_{V_{so}}(r) & \text{a real spin-orbit term,} \\
+id_{so}\,\vec{l}\cdot\vec{s}\,W_{so}\,h_{W_{so}}(r) & \text{and an imaginary spin-orbit term,}
\end{array}
$$

The real and imaginary volume terms are normally taken to be of Wood-Saxon form,

$$f_i = \frac{1}{1+\exp\left[(r-R_i)/a_i\right]} \qquad i = V, W\,,$$

Where R_i and a_i are radii and the diffuseness, respectively.

The real and imaginary surface terms of the optical potential are taken to be a Gaussian,

$$g_i(r) = \exp\left[\frac{(r-R_i)^2}{a_i^2}\right] \qquad i = V, W\,.$$

Neutron Scattering Cross-Sections

It was shown that at moderate energies when the effects of the individual states of the compound nucleus on the scattering are no longer resolved the cross-sections for the elastic scattering of nucleons by nuclei vary rather smoothly with energy and from one nucleus to the next.

Using compound nucleus model, the expressions for the absorption and elastic cross-section for neutrons incident on a nucleus of radius R can be expressed by

$$\sigma_A = \pi R^2 \left[1 - \left\{(1+2KR)e^{-2kR}\right\}/2K^2R^2\right]$$

$$\sigma_E = 2\pi\int_0^R \left|1-\exp(-K+2ik_1)s\right|^2 \rho\, d\rho$$

where $s^2 = R^2 - \rho^2$. The absorption coefficient K is related to the nuclear parameters by

$$K = \frac{3A\sigma}{4\pi R^2}$$

where σ is the mean cross-section for nuclear collisions.

$$\sigma = \left\{Z\sigma_{np}\alpha_{np} + N\sigma_{nn}\alpha_{nn}\right\}/A$$

The coefficients σ_{np} and σ_{nn} allow for the reduction in the cross-section due to the Pauli principle that occurs because some final states are already occupied.

The total absorption cross-section from the total measured flux, is

$$\sigma_A = -\int_0^{2\pi}\int_0^{\pi} \frac{i\hbar}{2mV}\left(\dot{\psi}\frac{\partial\psi}{\partial r} - \psi\frac{\partial\dot{\psi}}{\partial r}\right) r^2 \sin\theta \; d\theta \; d\phi.$$

Now the wavefunction

$$\psi = -\sum_{\ell} \frac{(2\ell+1)}{2ikr} \rho_{\ell}(\cos\theta)\,(S_{\ell} e^{ikr} - e^{-ikr})$$

where

$$S_{\ell} = e^{2i\delta_L}$$

and hence

$$\sigma_A = \frac{\pi}{k^2}\sum_{\ell}(2\ell+1)\,(1 - |S_{\ell}|^2)$$

The total cross-section is the sum of the total elastic cross-section σ_E and total absorption cross-section σ_A , so that

$$\sigma_T = \frac{2\pi}{k^2}\sum_{\ell}(2\ell+1)\,(1 - \mathrm{Re}\, S_{\ell})$$

Calculation procedure

As the ABAREX runs under DOS, the DOS has to be loaded. After loading DOS, the ABAREX program is loaded. Under ABAREX program INPUT.DAT is opened and some changes made to input data file.

C:\>ABAREX>EDIT INPUT ↵

The file is saved and closed. The calculation is done when we type this command.

C:\>ABAREX>DEL OUTPUT ↵

C:\>ABAREX>DEL PUNCH ↵

C:\>ABAREX>ABAREX ↵

To see and edit output results, we open ABAREX and rename it.

C:\>ABAREX>EDIT OUTPUT ↵

The nuclear code "SCAT2"

In SCAT2, projectile may be neutron, proton, deuteron and energy is up to several hundred MeV. There are five parameter sets, Wilmore Hodgson Parameter set, Bechetti Greenless Parameter set Ferrer Rapaport Parameter set, Bersillon Cindro Parameter set and Madland Parameter set, in SCAT2.

As the SCAT2 runs under DOS, we have to load the DOS. After loading DOS, we have to load the SCAT2 program. Under SCAT2 program we open INPUT.DAT and make some changes to input data file.

C:\>SCAT2>EDIT SCAT2TST.DAT↵

The file is saved and closed. The calculation is done when we type this command.

C:\>SCAT2>SCAT2↵

To see and edit output results, we open SCAT2 and rename it.

C:\>SCAT2>EDIT SCAT2TST.LST↵

Results

Table (1) Comparison of SCAT2 Optical Parameter Sets for S-32

	Total Cross Sections in barn (b)							
	SCAT2					Others' Work		
E (MeV)	WH	BG	FR	BC	ML	JENDL	TENDL	Best Fit
1	3.8721	3.5464	3.8903	4.6283	3.6310	2.9541		BG
2	3.5545	3.3845	3.4559	3.8943	3.4298	3.0590	3.4058	BG
3	3.3068	3.2626	3.2003	3.4012	3.2495	3.0508	3.3098	WH
4	3.0429	3.0985	2.9639	3.0363	3.0394	2.9199	3.0728	BG
5	2.7817	2.9180	2.7338	2.7173	2.8334	2.7385	2.7026	BC
6	2.5539	2.7458	2.5350	2.4516	2.6628	2.5355	2.5579	WH
7	2.3670	2.5952	2.3813	2.2640	2.5379	2.3410	2.3903	FR
8	2.2116	2.4696	2.2664	2.1341	2.4529	2.1878	2.2413	FR
9	2.0808	2.3656	2.1752	2.0290	2.3985	2.0763	2.1622	FR
10	1.9757	2.2777	2.0968	1.9395	2.3683	1.9866	2.1273	FR
11	1.8988	2.2032	2.0277	1.8711	2.3591	1.9013	2.1118	FR
12	1.8503	2.1416	1.9694	1.8274	2.3686	1.8264	2.1055	BG
13	1.8277	2.0926	1.9243	1.8074	2.3937	1.7717	2.0753	BG
14	1.8261	2.0556	1.8930	1.8073	2.4311	1.7370	2.0496	BG
15	1.8390	2.0292	1.8739	1.8221	2.4776	1.7201	2.0445	BG
16	1.8596	2.0118	1.8642	1.8461	2.5307	1.7217	2.0277	BG
17	1.8830	2.0012	1.8604	1.8740	2.5888	1.7404	2.0151	BG
18	1.9068	1.9958	1.8599	1.9020	2.6509	1.7720	2.0091	BG
19	1.9303	1.9941	1.8612	1.9277	2.7165	1.8117	2.0147	BG
20	1.9543	1.9950	1.8637	1.9508	2.7851	1.8556	2.0214	BG

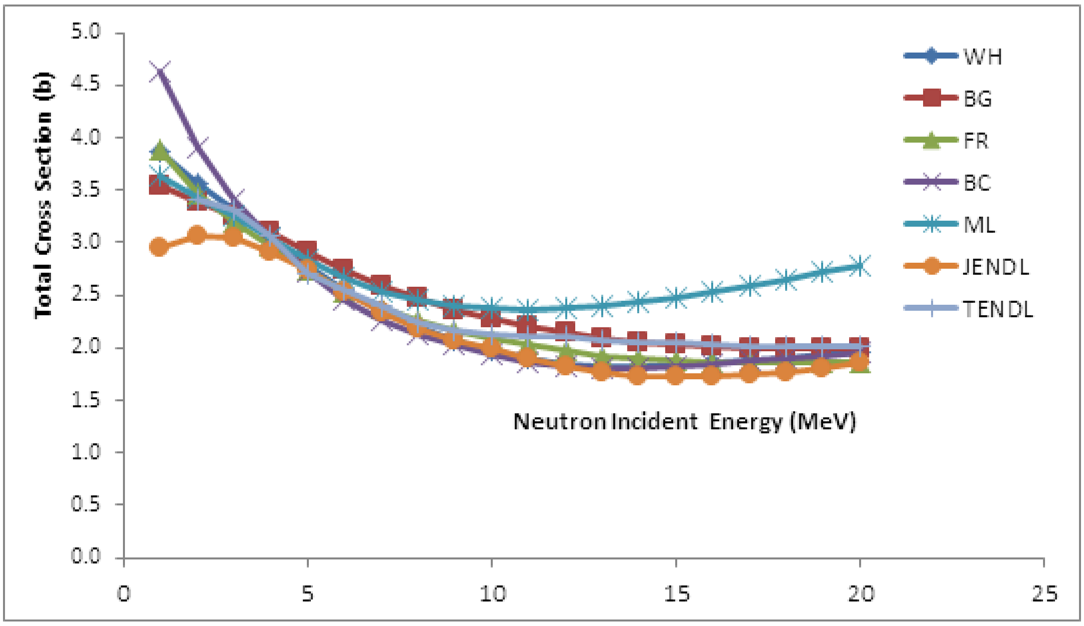

Figure (1) Comparison of SCAT2 Optical Parameter Sets for S-32

Table (2) Comparison of Total Cross Sections for S-32 at Vr = 48 MeV

	Total Cross Sections in barn (b)			
	Present Work		Others' Work	
E (MeV)	FERRER	ABAREX (V_r=48 MeV)	JENDL	TENDL
1	3.8903	3.2791	2.9541	
2	3.4559	3.2993	3.0590	3.4058
3	3.2003	3.2603	3.0508	3.3098
4	2.9639	3.1037	2.9199	3.0728
5	2.7338	2.8912	2.7385	2.7026
6	2.5350	2.6786	2.5355	2.5579
7	2.3813	2.4818	2.3410	2.3903
8	2.2664	2.3043	2.1878	2.2413
9	2.1752	2.1517	2.0763	2.1622
10	2.0968	2.0285	1.9866	2.1273
11	2.0277	1.9352	1.9013	2.1118
12	1.9694	1.8690	1.8264	2.1055
13	1.9243	1.8250	1.7717	2.0753
14	1.8930	1.7967	1.7370	2.0496
15	1.8739	1.7772	1.7201	2.0445
16	1.8642	1.7615	1.7217	2.0277
17	1.8604	1.7473	1.7404	2.0151
18	1.8599	1.7351	1.7720	2.0091
19	1.8612	1.7262	1.8117	2.0147
20	1.8637	1.7221	1.8556	2.0214

Table (3) Comparison of Total Cross Sections for S-32 at W = 22 MeV

	Total Cross Sections in barn (b)			
	Present Work		Others' Work	
E (MeV)	FERRER	ABAREX (W = 22 MeV)	JENDL	TENDL
1	3.8903	3.2714	2.9541	
2	3.4559	3.1333	3.0590	3.4058
3	3.2003	3.0050	3.0508	3.3098
4	2.9639	2.8405	2.9199	3.0728
5	2.7338	2.6607	2.7385	2.7026
6	2.5350	2.4905	2.5355	2.5579
7	2.3813	2.3412	2.3410	2.3903
8	2.2664	2.2138	2.1878	2.2413
9	2.1752	2.1068	2.0763	2.1622
10	2.0968	2.0188	1.9866	2.1273
11	2.0277	1.9488	1.9013	2.1118
12	1.9694	1.8952	1.8264	2.1055
13	1.9243	1.8558	1.7717	2.0753
14	1.8930	1.8277	1.7370	2.0496
15	1.8739	1.8082	1.7201	2.0445
16	1.8642	1.7949	1.7217	2.0277
17	1.8604	1.7865	1.7404	2.0151
18	1.8599	1.7822	1.7720	2.0091
19	1.8612	1.7818	1.8117	2.0147
20	1.8637	1.7849	1.8556	2.0214

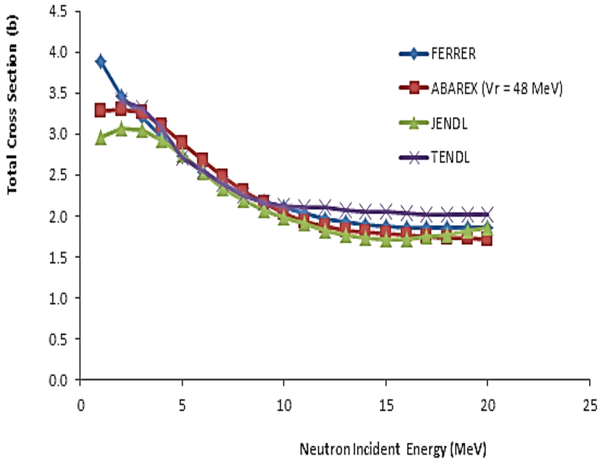

Figure (2) Comparison of Total Cross Sections for S-32 at Vr = 48 MeV

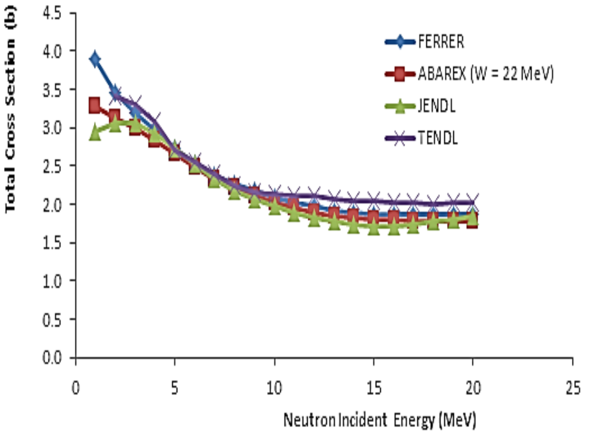

Figure (3) Comparison of Total Cross Sections for S-32 at W = 22 MeV

Table (4) Comparison of Total Cross Sections for S-32 at Vso = 7 MeV

	Total Cross Sections in barn (b)			
	Present Work		Others' Work	
E (MeV)	FERRER	ABAREX (V_{so} = 7 MeV)	JENDL	TENDL
1	3.8903	3.5962	2.9541	
2	3.4559	3.3711	3.0590	3.4058
3	3.2003	3.1949	3.0508	3.3098
4	2.9639	2.9909	2.9199	3.0728
5	2.7338	2.7659	2.7385	2.7026
6	2.5350	2.5553	2.5355	2.5579
7	2.3813	2.3710	2.3410	2.3903
8	2.2664	2.2089	2.1878	2.2413
9	2.1752	2.0686	2.0763	2.1622
10	2.0968	1.9541	1.9866	2.1273
11	2.0277	1.8676	1.9013	2.1118
12	1.9694	1.8080	1.8264	2.1055
13	1.9243	1.7715	1.7717	2.0753
14	1.8930	1.7525	1.7370	2.0496
15	1.8739	1.7444	1.7201	2.0445
16	1.8642	1.7416	1.7217	2.0277
17	1.8604	1.7408	1.7404	2.0151
18	1.8599	1.7410	1.7720	2.0091
19	1.8612	1.7429	1.8117	2.0147
20	1.8637	1.7478	1.8556	2.0214

Table (5) Comparison of Total Cross Sections for S-32 at r1 = 1.28 fm.

	Total Cross Sections in barn (b)			
	Present Work		Others' Work	
E (MeV)	FERRER	ABAREX (r_1 = 1.28 fm)	JENDL	TENDL
1	3.8903	3.7706	2.9541	
2	3.4559	3.3498	3.0590	3.4058
3	3.2003	3.0541	3.0508	3.3098
4	2.9639	2.8139	2.9199	3.0728
5	2.7338	2.5958	2.7385	2.7026
6	2.5350	2.4034	2.5355	2.5579
7	2.3813	2.2450	2.3410	2.3903
8	2.2664	2.1144	2.1878	2.2413
9	2.1752	2.0020	2.0763	2.1622
10	2.0968	1.9056	1.9866	2.1273
11	2.0277	1.8281	1.9013	2.1118
12	1.9694	1.7719	1.8264	2.1055
13	1.9243	1.7366	1.7717	2.0753
14	1.8930	1.7193	1.7370	2.0496
15	1.8739	1.7157	1.7201	2.0445
16	1.8642	1.7208	1.7217	2.0277
17	1.8604	1.7302	1.7404	2.0151
18	1.8599	1.7412	1.7720	2.0091
19	1.8612	1.7529	1.8117	2.0147
20	1.8637	1.7653	1.8556	2.0214

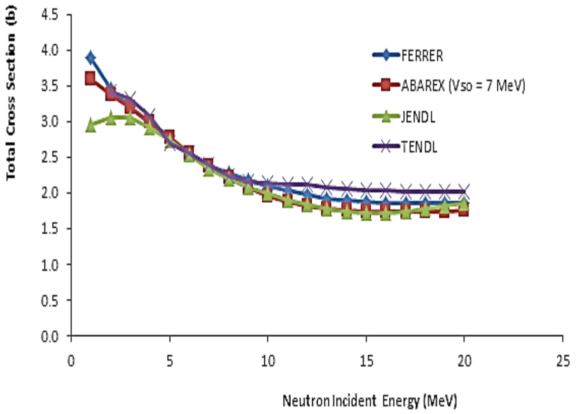

Figure (4) Comparison of Total Cross Sections for S-32 at Vso = 7 MeV

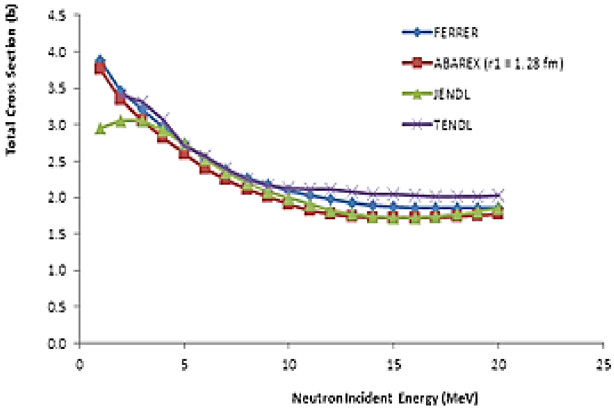

Figure (5) Comparison of Total Cross Sections for S-32 at r1 = 1.28 fm.

Table (6) Comparison of Total Cross Sections for S-32 at r2 = 1.44 fm.

	Total Cross Sections in barn (b)			
	Present Work		Others' Work	
E (MeV)	FERRER	ABAREX (r_2 = 1.44 fm)	JENDL	TENDL
1	3.8903	3.6000	2.9541	
2	3.4559	3.3639	3.0590	3.4058
3	3.2003	3.1841	3.0508	3.3098
4	2.9639	2.9804	2.9199	3.0728
5	2.7338	2.7563	2.7385	2.7026
6	2.5350	2.5463	2.5355	2.5579
7	2.3813	2.3623	2.3410	2.3903
8	2.2664	2.2003	2.1878	2.2413
9	2.1752	2.0601	2.0763	2.1622
10	2.0968	1.9456	1.9866	2.1273
11	2.0277	1.8591	1.9013	2.1118
12	1.9694	1.7994	1.8264	2.1055
13	1.9243	1.7630	1.7717	2.0753
14	1.8930	1.7441	1.7370	2.0496
15	1.8739	1.7361	1.7201	2.0445
16	1.8642	1.7334	1.7217	2.0277
17	1.8604	1.7325	1.7404	2.0151
18	1.8599	1.7325	1.7720	2.0091
19	1.8612	1.7342	1.8117	2.0147
20	1.8637	1.7389	1.8556	2.0214

Table (7) Comparison of Total Cross Sections for S-32 at rso = 1.42 fm.

	Total Cross Sections in barn (b)			
	Present Work		Others' Work	
E (MeV)	FERRER	ABAREX (r_{so} = 1.42 fm)	JENDL	TENDL
1	3.8903	3.5932	2.9541	
2	3.4559	3.3799	3.0590	3.4058
3	3.2003	3.2070	3.0508	3.3098
4	2.9639	2.9967	2.9199	3.0728
5	2.7338	2.7657	2.7385	2.7026
6	2.5350	2.5531	2.5355	2.5579
7	2.3813	2.3684	2.3410	2.3903
8	2.2664	2.2053	2.1878	2.2413
9	2.1752	2.0639	2.0763	2.1622
10	2.0968	1.9492	1.9866	2.1273
11	2.0277	1.8647	1.9013	2.1118
12	1.9694	1.8094	1.8264	2.1055
13	1.9243	1.7786	1.7717	2.0753
14	1.8930	1.7650	1.7370	2.0496
15	1.8739	1.7608	1.7201	2.0445
16	1.8642	1.7598	1.7217	2.0277
17	1.8604	1.7595	1.7404	2.0151
18	1.8599	1.7600	1.7720	2.0091
19	1.8612	1.7627	1.8117	2.0147
20	1.8637	1.7691	1.8556	2.0214

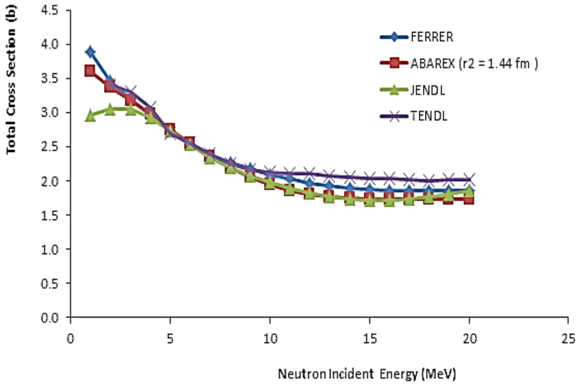

Figure (6) Comparison of Total Cross Sections for S-32 at r2 = 1.44 fm.

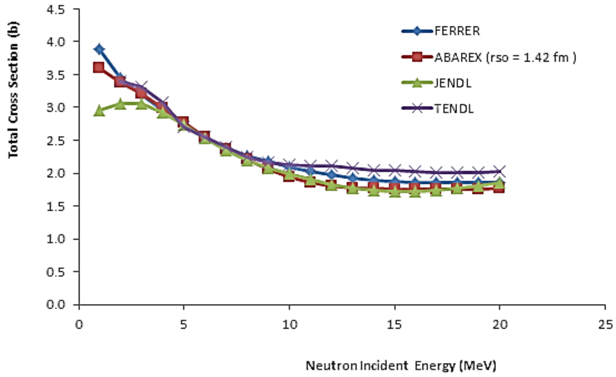

Figure (7) Comparison of Total Cross Sections for S-32 at rso = 1.42 fm.

Table (8) Comparison of Total Cross Sections for S-32 at a1 = 0.65 fm.

E (MeV)	Total Cross Sections in barn (b)			
	Present Work		Others' Work	
	FERRER	ABAREX (a_1 = 0.65 fm)	JENDL	TENDL
1	3.8903	3.5952	2.9541	
2	3.4559	3.4023	3.0590	3.4058
3	3.2003	3.2541	3.0508	3.3098
4	2.9639	3.0585	2.9199	3.0728
5	2.7338	2.8302	2.7385	2.7026
6	2.5350	2.6133	2.5355	2.5579
7	2.3813	2.4220	2.3410	2.3903
8	2.2664	2.2534	2.1878	2.2413
9	2.1752	2.1083	2.0763	2.1622
10	2.0968	1.9907	1.9866	2.1273
11	2.0277	1.9025	1.9013	2.1118
12	1.9694	1.8420	1.8264	2.1055
13	1.9243	1.8049	1.7717	2.0753
14	1.8930	1.7848	1.7370	2.0496
15	1.8739	1.7748	1.7201	2.0445
16	1.8642	1.7694	1.7217	2.0277
17	1.8604	1.7659	1.7404	2.0151
18	1.8599	1.7638	1.7720	2.0091
19	1.8612	1.7644	1.8117	2.0147
20	1.8637	1.7687	1.8556	2.0214

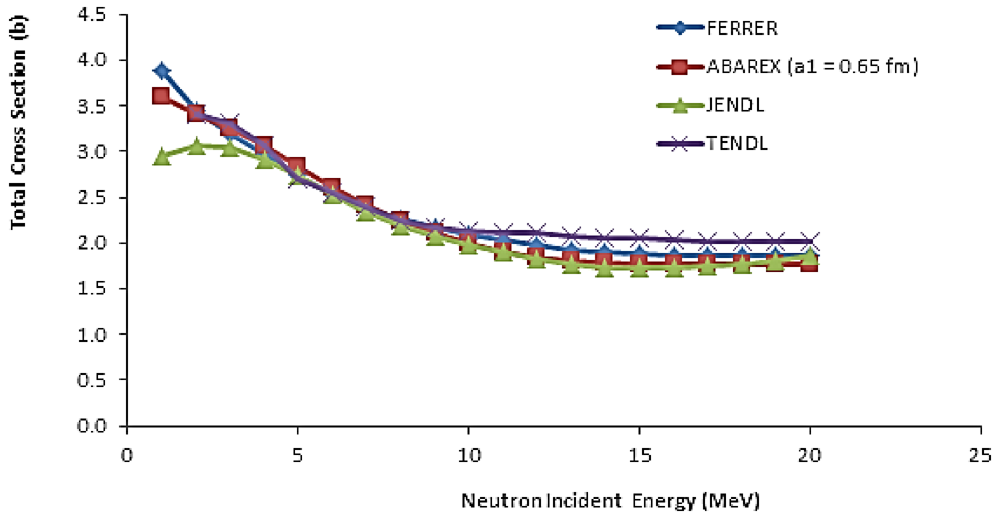

Figure (8) Comparison of Total Cross Sections for S-32 at a1 = 0.65 fm.

Table (9) Comparison of Total Cross Sections for S-32 at a2 = 0.23 fm.

	Total Cross Sections in barn (b)			
	Present Work		Others' Work	
E (MeV)	FERRER	ABAREX (a_2 = 0.23 fm)	JENDL	TENDL
1	3.8903	3.6405	2.9541	
2	3.4559	3.3944	3.0590	3.4058
3	3.2003	3.2088	3.0508	3.3098
4	2.9639	2.9993	2.9199	3.0728
5	2.7338	2.7671	2.7385	2.7026
6	2.5350	2.5509	2.5355	2.5579
7	2.3813	2.3617	2.3410	2.3903
8	2.2664	2.1933	2.1878	2.2413
9	2.1752	2.0461	2.0763	2.1622
10	2.0968	1.9260	1.9866	2.1273
11	2.0277	1.8363	1.9013	2.1118
12	1.9694	1.7759	1.8264	2.1055
13	1.9243	1.7407	1.7717	2.0753
14	1.8930	1.7246	1.7370	2.0496
15	1.8739	1.7202	1.7201	2.0445
16	1.8642	1.7207	1.7217	2.0277
17	1.8604	1.7222	1.7404	2.0151
18	1.8599	1.7237	1.7720	2.0091
19	1.8612	1.7262	1.8117	2.0147
20	1.8637	1.7313	1.8556	2.0214

Table (10) Comparison of Total Cross Sections for S-32 at aso = 0.60 fm.

E (MeV)	Total Cross Sections in barn (b)			
	Present Work		Others' Work	
	FERRER	ABAREX (a_{so} = 0.60 fm)	JENDL	TENDL
1	3.8903	3.5958	2.9541	
2	3.4559	3.3692	3.0590	3.4058
3	3.2003	3.1930	3.0508	3.3098
4	2.9639	2.9904	2.9199	3.0728
5	2.7338	2.7664	2.7385	2.7026
6	2.5350	2.5558	2.5355	2.5579
7	2.3813	2.3705	2.3410	2.3903
8	2.2664	2.2073	2.1878	2.2413
9	2.1752	2.0663	2.0763	2.1622
10	2.0968	1.9513	1.9866	2.1273
11	2.0277	1.8646	1.9013	2.1118
12	1.9694	1.8049	1.8264	2.1055
13	1.9243	1.7683	1.7717	2.0753
14	1.8930	1.7493	1.7370	2.0496
15	1.8739	1.7411	1.7201	2.0445
16	1.8642	1.7383	1.7217	2.0277
17	1.8604	1.7373	1.7404	2.0151
18	1.8599	1.7374	1.7720	2.0091
19	1.8612	1.7393	1.8117	2.0147
20	1.8637	1.7442	1.8556	2.0214

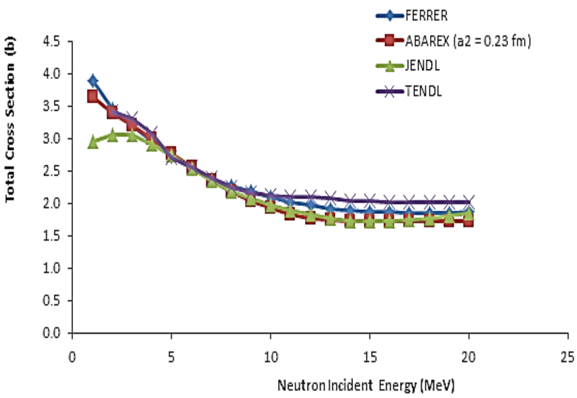

Figure (9) Comparison of Total Cross Sections for S-32 at a2 = 0.23 fm.

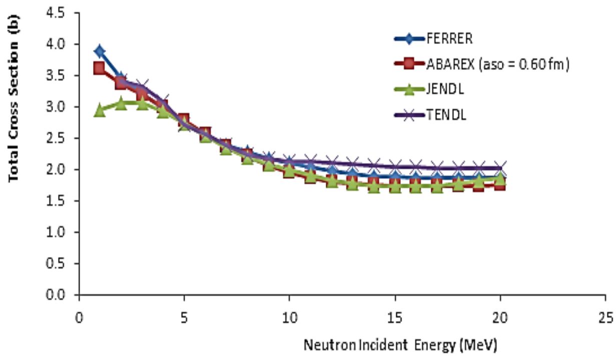

Figure (10) Comparison of Total Cross Sections for S-32 at aso = 0.60 fm.

Discussion

The comparison of total cross sections using various built in parameter sets of SCAT2 is shown in Table (1) and the respective graph is shown in Figure (1). It is found that the results obtained by using Ferrer parameter set of SCAT2 are in better agreement with IAEA data than other SCAT2 parameter sets, and thus we have used Ferrer parameter set for SCAT2 calculations.

The comparison of total cross sections using real potential 48 MeV with IAEA data is shown in Table (2) and the respective graph is shown in Figure (2). It is found that the calculated results agree with those of IAEA data.

The comparison of total cross sections using imaginary potential 22 MeV with IAEA data is shown in Table (3) and the respective graph is shown in Figure (3). It is found that the calculated results are in good agreement with those of IAEA data.

The comparison of total cross sections using spin orbit potential 7 MeV with IAEA data is shown in Table (4) and the respective graph is shown in Figure (4). It is found that the calculated results are in good agreement with those of IAEA data.

The comparison of total cross sections using real potential radius 1.28 fm with IAEA data is shown in Table (5) and the respective graph is shown in Figure (5). From the graph, it is found that the calculated results agree with those of IAEA data.

The comparison of total cross sections using imaginary potential radius 1.44 fm with IAEA data is shown in Table (6) and the respective graph is shown in Figure (6). From the graph, it is found that the calculated results agree with those of IAEA data.

The comparison of total cross sections using spin orbit potential radius 1.42 fm with IAEA data is shown in Table (7) and the respective graph is shown in Figure (7). From the graph, it is found that our calculated results are in good agreement with those of IAEA data.

The comparison of total cross sections using real potential diffuseness 0.65 fm with IAEA data is shown in Table (8) and the respective graph is shown in Figure(8). From the graph, it is found that the calculated results are in good agreement with those of IAEA data.

The comparison of total cross sections using imaginary potential diffuseness 0.23 fm with IAEA data is shown in Table (9) and the respective graph is shown in Figure (9). From the graph, we can see that our calculated results agree with those of IAEA data.

The comparison of total cross sections using spin orbit potential diffuseness 0.60 fm with IAEA data is shown in Table (10) and the respective graph is shown in Figure (10). From the graph, we can see that our calculated results are in good agreement with those of IAEA data.

Conclusion

There are five parameter sets used in SCAT2, and Ferrer parameter set is the best one for S-32. For real potential, the evaluated value 48 MeV can give total neutron cross sections which are in good agreement with those of IAEA data. There are some minor differences below 3 MeV, but the differences are negligible. The imaginary potential 22 MeV, the spin orbit potential 7 MeV, real potential radius 1.28 fm., imaginary potential radius 1.44 fm., spin orbit potential radius 1.42 fm., real potential diffuseness 0.65 fm., imaginary potential diffuseness 0.23 fm. and spin orbit potential diffuseness 0.60 fm. also are useful for the one parameter fitting procedure.

Using all the nine parameters, total cross sections using our evaluated parameter set are in better agreement with IAEA evaluated data than SCAT2 results.

Comparing with JENDL4.0 and TENDL optical potential parameter set, which is currently most popular in the field of neutron cross section evaluation, our evaluated parameter set is better in calculating total neutron cross sections for S-32.

It is found that our evaluated cross sections are in better agreement with experimental results. The evaluated parameters are not so much different from other parameter sets. Only above the 10 MeV TENDAL parameter set is a little larger than other data, but the results obtained by using it are in good agreement with IAEA data.

The evaluated optical model parameters can be used as local optical model parameter set for S-32, and the result may be useful for the development of a global parameter set which will be useful for all nuclides.

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