Theoretical Evaluation of Neutron-nucleus Scattering Parameters from Experimental Data in the $6 \leq A < 60$ Mass Region

A. Aleksejevs, S. Barkanova, J. Tambergs, T. Krasta, W. Waschkowski[a], and K. Knopf[a]

Nuclear Research Center, 31 Miera Str., LV-2169, Salaspils, Latvia

[a] Physik Department der Technischen Universität München, FRM-Reaktorstation Garching, D-85747 Garching

Z. Naturforsch. **53 a,** 855–862 (1998); received September 21, 1998

Systematic calculations of the neutron-nucleus scattering parameters at several neutron energies E_i < 2 keV have been performed for 37 isotopes (^{6}Li, ... ^{59}Co) in the mass region of $6 \leq A < 60$, using the large compilation of experimental neutron-nucleus scattering data obtained in Garching. In the first stage of these calculations, the s-wave potential scattering radius R', the scattering lengths b_{coh}, $b_{\pm}$, and the bound state parameters (E_{b}, $\Gamma_{\gamma\mathrm{r}}$, $g\Gamma_{\mathrm{n}}^0$) have been calculated for each isotope, employing the general least squares fit (GLSQF) for the experimental and the corresponding theoretical values of the total neutron-nucleus cross sections $\sigma_{\mathrm{tot}}^{\mathrm{exp}}(E_i)$ at several energies E_i, absorption cross sections $\sigma_{\mathrm{abs}}(E_0)$ and of the coherent scattering lengths b_{coh}. The theoretical expressions for these parameters were deduced on the basis of the usual S-matrix formalism with no assumption about the particular shape of the optical model potential. In the second stage of our calculations, the spherical Fiedeldey-Frahn optical potential was employed for the pure theoretical description or the above mentioned neutron-nucleus scattering characteristics. The results obtained have been analyzed and compared with the values deduced from measurements.

PACS 34.50B

Reprint requests to Dr. W. Waschkowski; Fax: +49 89 289 12162, E-mail: wwasch@physik.tu-muenchen.de