Update and Extension of the Nuclear Astrophysics Compilation of Reaction Rates (NACRE): Charged-Particle Thermonuclear Rates with A<16 *

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A library of easily accessible state-of-the-art nuclear reaction rates is essential to the study of nucleosynthesis and stellar evolution. In this presentation, we report a new evaluation of reaction rates for 21 capture and 15 transfer reactions on stable targets with mass numbers A<16. At low energies where no experimental data is available, the astrophysical S-factors, together with their uncertainties, are evaluated on the basis of the potential model (PM) for capture reactions and thedistorted wave Born approximation (DWBA) for transfer reactions. The model parameters are obtained from a fit to the available experimental data. The extrapolated S-factors from PM and DWBA evaluation are utilized to calculate the reaction rates and corresponding uncertainties. At high energies, whenever available, experimental cross sections (and astrophysical S-factors) as well as their errors are used to compute the reaction rates and corresponding uncertainties. A new evaluation of reaction rates is provided as numerical tables and compared with the NACRE compilation. The new reaction rates are believed to be more reliable than those previously determined due to the physical models adopted to extrapolate the S-factors at low energies and the updated sets of experimental data considered.

*This work has been carried out within the framework of the Konan-ULB convention.