APPENDIX A

Evaluation of the accuracy of reaction rate calculations

The sensitivity of reaction rate calculations on the computing procedure is illustrated relatively in the definition of input parameters, energy integration limits E_{min} , E_{max} , and integration step E_{step} according to the formula:

$$N_A \langle \sigma v \rangle = 3.7313 \cdot 10^4 \,\mu^{-1/2} T_9^{-3/2} \int_{E_{\min}}^{E_{\max}} \sigma(E) E \exp(-11.605 E \,/\, T_9) dE.$$
(A1)

Results for the ⁸Li(n,γ)⁹Li in Figure A1 suggest that at the lower limit of the cross section $E_{min} = 10^{-8}$ MeV, the upper limit E_{max} might be not less than 3 MeV, otherwise the high Z_9 reaction rate and yield are underestimated. The effect of a variation of integration step E_{step} from 0.1 keV to 1 keV at fixed limits $E_{min} = 10^{-8}$ MeV and $E_{max} = 5$ MeV is illustrated in Figure A2. $E_{step} = 0.25$ keV is optimal for the reaction rate calculations at $T_9 < 0.1$.



FIGURE A1 Dependence of the reaction rate at high temperature on the upper limit of integration in Eq. A1, varied from 1 MeV to 7 MeV at a constant step of 0.25 keV.



FIGURE A2 Dependence of the form of the reaction rate at low temperatures on the integration step in Eq. A1, $E_{step} = 0.1 \text{ keV} - 1 \text{ keV}$ at a constant upper limit of 5 MeV.

APPENDIX B

TABLE B1 ⁸ Li (n,γ) ⁹ Li radiative capture reaction rates				
T_9	$N_{\rm A} < \sigma v >$, Upper set	$N_{\rm A} < \sigma v >$, Lower set		
0.01	6480	3325		
0.03	6580	3370		
0.05	6600	3390		
0.07	6620	3400		
0.1	6650	3410		
0.3	7040	3620		
0.5	8130	4200		
0.7	9480	4900		
1	11000	5740		
3	11560	6500		
5	10390	6550		
7	9520	6500		
10	8520	6200		

Reaction rates tabulated numerical data and their parametrizations

The calculated MPCM reaction rate, shown in Figure 3, is parametrized as [80]:

$$N_A \langle \sigma v \rangle = a_1 + a_2 / T_9^{b_1} \exp(-a_3 / T_9^{b_2}) + a_4 T_9^{b_3}.$$

with parameters from Table B2.

TABLE B2 Analytical parameterization parameters (19) of the reaction rate

Upper set			Lower set	
i	a_i	b_i	a_i	b_i
1	3919.237	1.64164	2572.835	0.1857
2	223300.7	0.62265	3937.451	1.61011
3	-3.95089	7.83183E-4	-0.62318	0.07409
4	2714.477		1031.804	
$\chi^2 = 0.013$			$\chi^2 = 0.03$	