Erratum: Gamow shell model description of the radiative capture reaction $^8B(p, \gamma)^9C$ [Phys. Rev. C 107, 044613 (2023)]

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We discovered an unfortunate error regarding the treatment of effective charge in the code. It originated from a wrong normalization of capturing states in radiative capture cross sections. Hence, in order to compensate for this error, larger effective charges were used to reproduce experimental data. The code used is publicly available in Ref. [1] and the error has been corrected in the latest version. The error in cross sections is proportional to the square of the scaling factor f_{E1} in the used effective charge. However, the overall shape of the cross section is almost the same.

Correcting the error resulted in an increase of the astrophysical factors for $^8B(p, \gamma)^9C$. Here, we provide the most relevant corrections. The total astrophysical factor S is shown in Fig. 7. The S at $E_{c.m.} \to 0$ is given in Fig. 9. The astrophysical reaction rate is shown in Fig. 10.

From the corrected figures, it is seen that with the standard $E1$ effective charge ($f_{E1} = 1.0$), the astrophysical factor by GSM-CC agrees with most of the experimental data. With the corrected reaction rate of $^8B(p, \gamma)^9C$, the most efficient temperature for the ^9C formation is in the range of $0.14 \leqslant T_9 \leqslant 0.84$.

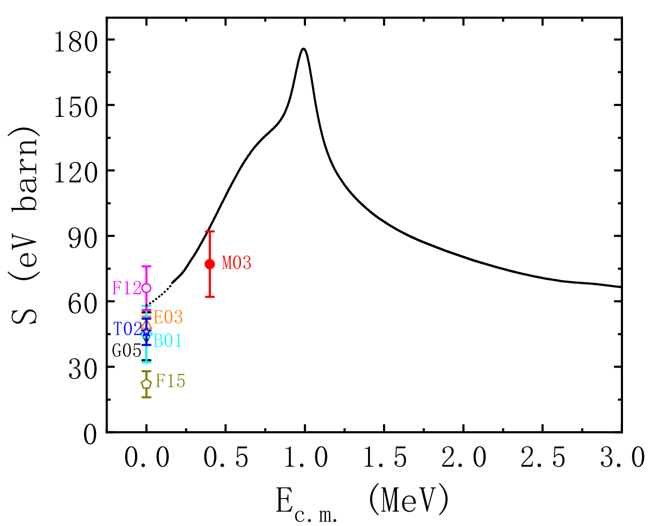

FIG. 7. The total astrophysical S factor for the radiative proton capture to the ground state of ^9C is plotted as a function of proton projectile energy. The astrophysical factor of the proton radiative capture reaction in the limit $E_{c.m.} \to 0$ has been extracted by using an expansion from a quadratic polynomial (dashed line), whose parameters are obtained by fitting the calculated function $S(E_{c.m.})$ in the energy range $0.1 \leqslant E_{c.m.} \leqslant 0.3$ MeV. The experimental data for the astrophysical factor in the limit $E_{c.m.} \to 0$, taken from Refs. [2–7], are labeled as “E03”, “T02”, “B01”, “G05”, “F12”, and “F15”, respectively. The astrophysical factor extracted from the Coulomb dissociation experiment [8] in the energy range 0.2 MeV $\leqslant E_{c.m.} \leqslant$ 0.6 MeV is labeled as “M03”.

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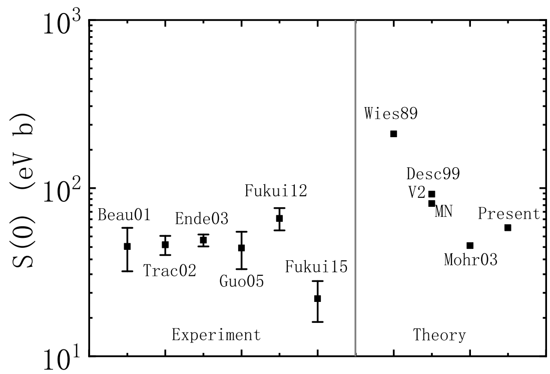

FIG. 9. Comparison between different experimental analyses [2–7] and various theoretical calculations [9–11] of the total astrophysical S factor at $E_{\text{c.m.}} = 0$. The GSM-CC result is labeled as “Present”.

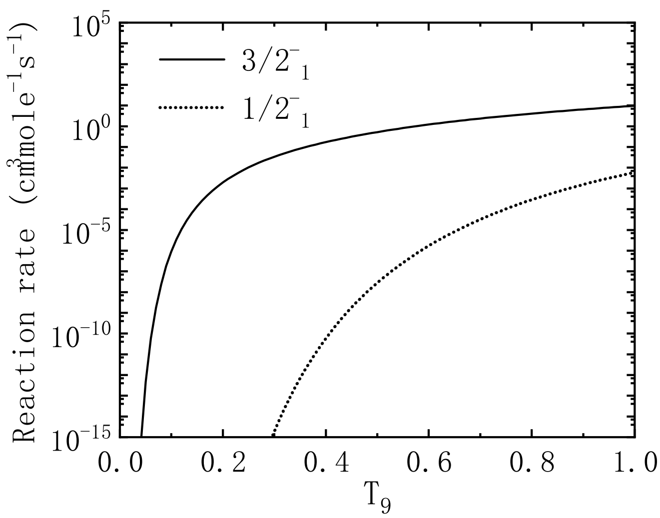

FIG. 10. The reaction rate of ^{8}B$(p,\gamma)^9$C as a function of the temperature T_9 calculated by GSM-CC. The solid line represents the direct capture rate to the ground state $3/2^-_1$ and the dotted line depicts the capture to the first excited resonance state $1/2^-_1$.

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[1] https://github.com/GSMUTNSR.
[2] D. Beaumel, T. Kubo, T. Teranishi, H. Sakurai, S. Fortier, A. Mengoni, N. Aoi, N. Fukuda, M. Hirai, N. Imai, H. Iwasaki, H. Kumagai, H. Laurent, S. M. Lukyanov, J. M. Maison, T. Motobayashi, T. Nakamura, H. Ohnuma, S. Pita, K. Yoneda, and M. Ishihara, Phys. Lett. B **514**, 226 (2001).
[3] B. Guo, Z. Li, W. Liu, X. Bai, G. Lian, S. Yan, B. Wang, S. Zeng, J. Su, and Y. Lu, Nucl. Phys. A **761**, 162 (2005).
[4] L. Trache, F. Carstoiu, A. M. Mukhamedzhanov, and R. E. Tribble, Phys. Rev. C **66**, 035801 (2002).
[5] T. Fukui, K. Ogata, K. Minomo, and M. Yahiro, Phys. Rev. C **86**, 022801(R) (2012).
[6] T. Fukui, K. Ogata, and M. Yahiro, Phys. Rev. C **91**, 014604 (2015).
[7] J. Enders, T. Baumann, B. A. Brown, N. H. Frank, P. G. Hansen, P. R. Heckman, B. M. Sherrill, A. Stolz, M. Thoennessen, J. A. Tostevin, E. J. Tryggestad, S. Typel, and M. S. Wallace, Phys. Rev. C **67**, 064301 (2003).
[8] T. Motobayashi, Nucl. Phys. A **719**, C65 (2003).
[9] M. Wiescher, J. Görres, S. Graff, L. Buchmann, and F.-K. Thielemann, Astrophys. J. **343**, 352 (1989).
[10] P. Descouvemont, Nucl. Phys. A **646**, 261 (1999).
[11] P. Mohr, Phys. Rev. C **67**, 065802 (2003).