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- [1] V. Singh, J. Vadas, T. Steinbach, B. Wiggins, S. Hudan, R. de Souza, Z. Lin, C. Horowitz, L. Baby, S. Kuvin, V. Tripathi, I. Wiedenhöver, and A. Umar, Fusion enhancement at near and sub-barrier energies in ¹⁹O+¹²C, Physics Letters B **765**, 99 (2017).
- [2] V. I. Zagrebaev, V. V. Samarin, and W. Greiner, Subbarrier fusion of neutron-rich nuclei and its astrophysical consequences, Phys. Rev. C 75, 035809 (2007).
- [3] E. Salpeter, Electrons Screening and Thermonuclear Reactions, Australian Journal of Physics 7, 373 (1954).
- [4] S. Ichimaru, Strongly coupled plasmas: high-density classical plasmas and degenerate electron liquids, Rev. Mod. Phys. **54**, 1017 (1982).
- [5] B. L. Whitten, N. F. Lane, and J. C. Weisheit, Plasma-screening effects on electron-impact excitation of hydrogenic ions in dense plasmas, Phys. Rev. A 29, 945 (1984).
- [6] C. E. Rolfs and W. S. Rodney, *Cauldrons in the cosmos*, Theoretical Astrophysics (University of Chicago Press, Chicago, IL, 2006).
- [7] B. Jancovici, Pair correlation function in a dense plasma and pycnonuclear reactions in stars, J. of Stat. Phys. 17, 357 (1977).
- [8] M. Aliotta and K. Langanke, Screening effects in stars and in the laboratory, Front. Phys. 10, 942726 (2022).
- [9] E. G. Adelberger et al., Solar fusion cross sections. II. The pp chain and CNO cycles, Rev. Mod. Phys. 83, 195 (2011).
- [10] N. Itoh, H. Totsuji, S. Ichimaru, and H. E. De-Witt, Enhancement of thermonuclear reaction rates due to strong screening. II Ionic mixtures, The Astrophys. J. 234, 1079 (1979).
- [11] D. L. Bleuel *et al.*, Method for Detection of Nuclear-Plasma Interactions in a ¹³⁴Xe-Doped Exploding Pusher at the National Ignition Facility, Plasma and Fusion Research **11**, 3401075 (2016).
- [12] S. Helmrich, K. Spenneberg, and A. Pálffy, Coupling highly excited nuclei to the atomic shell in dense astrophysical plasmas, Phys. Rev. C 90, 015802 (2014).
- [13] A. Pálffy, W. Scheid, and Z. Harman, Theory of nuclear excitation by electron capture for heavy ions, Phys. Rev. A 73, 012715 (2006).
- [14] M. Morita, Nuclear Excitation by Electron Transition and Its Application to Uranium 235 Separation, Progress of Theoretical Physics 49, 1574 (1973), https://academic.oup.com/ptp/article-pdf/49/5/1574/54
- [15] R. Gallino *et al.*, Evolution and nucleosynthesis in low-mass asymptotic giant branch stars. II. Neutron capture and the s-process, The Astrophys. J. **497**, 388 (1998).
- [16] M. Mosconi, M. Heil, F. Käppeler, R. Plag, and A. Men-

- goni, Neutron physics of the Re/Os clock. II. The (n, n') cross section of ¹⁸⁷Os at 30 keV neutron energy, Phys. Rev. C 82, 015803 (2010).
- [17] K. Fujii et al., Neutron physics of the re/os clock. iii. resonance analyses and stellar (n, γ) cross sections of 186,187,188 Os, Phys. Rev. C 82, 015804 (2010).
- [18] I. Lee and A. Diaz-Torres, Coherence dynamics in low-energy nuclear fusion, Physics Letters B 827, 136970 (2022).
- [19] A. A. Dzhioev, A. I. Vdovin, G. Martínez-Pinedo, J. Wambach, and C. Stoyanov, Thermal quasiparticle random-phase approximation with Skyrme interactions and supernova neutral-current neutrino-nucleus reactions, Phys. Rev. C 94, 015805 (2016).
- [20] A. A. Dzhioev, K. Langanke, G. Martínez-Pinedo, A. I. Vdovin, and C. Stoyanov, Unblocking of stellar electron capture for neutron-rich N=50 nuclei at finite temperature, Phys. Rev. C 101, 025805 (2020).
- [21] A. B. Balantekin and N. Takigawa, Quantum tunneling in nuclear fusion, Rev. Mod. Phys. 70, 77 (1998).
- [22] R. Thompson, A. Ikeda, R. Sheline, J. Cunnane, S. Yates, and P. Daly, Levels of ¹⁸⁸Os populated in the ¹⁸⁹Os(d, t)¹⁸⁸Os reaction and in the decay of 41h ¹⁸⁸Ir, Nuclear Physics A **245**, 444 (1975).
- [23] L. C. Chamon, B. V. Carlson, L. R. Gasques, D. Pereira, C. De Conti, M. A. G. Alvarez, M. S. Hussein, M. A. Cândido Ribeiro, E. S. Rossi, and C. P. Silva, Toward a global description of the nucleus-nucleus interaction, Phys. Rev. C 66, 014610 (2002).
- [24] National Nuclear Data Center, information extracted from the NuDat database, https://www.nndc.bnl.gov/nudat/.
- [25] G. Gosselin and P. Morel, Enhanced nuclear level decay in hot dense plasmas, Phys. Rev. C 70, 064603 (2004).
- [26] G. Gosselin, V. Méot, and P. Morel, Modified nuclear level lifetime in hot dense plasmas, Phys. Rev. C 76, 044611 (2007).
- [27] C. J. Chiara, J. J. Carroll, M. P. Carpenter, J. P. Greene, D. J. Hartley, R. V. F. Janssens, G. J. Lane, J. C. Marsh, D. A. Matters, M. Polasik, J. Rzadkiewicz, D. Seweryniak, S. Zhu, S. Bottoni, A. B. Hayes, and S. A. Karamian, Isomer depletion as experimental evidence of nuclear excitation by electron capture, Nature 554, 216 (2018).
- https://academic.oup.com/ptp/article-pdf/49/5/1574/5411690/49xcitationard by electron capture in excited ions, R. Gallino et al., Evolution and nucleosynthesis in low
 Progress of Theoretical Physics 49, 1574 (1973), [28] S. Gargiulo, I. Madan, and F. Carbone, Nuclear https://academic.oup.com/ptp/article-pdf/49/5/1574/5411690/49xcitationard by electron capture in excited ions, Phys. Rev. Lett. 128, 212502 (2022).
 - [29] C. Dasso, S. Landowne, and A. Winther, Channel-coupling effects in heavy-ion fusion reactions, Nuclear Physics A 405, 381 (1983).