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Three-Body Cs(H₂, γ)La Nuclear Synthesis in Cuboctahedron CsH₂Pd₁₂

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Three-body CsH_2 eigenvalues in a cuboctahedron CsH_2Pd_{12} molecule are calculated in the range from 0.01fm to several ten nano-meter in one stretch, by using 100 significant figure. We utilized five traditional potentials (nuclear Woods-Saxon, three-ion repulsive Coulomb, ion-Pd repulsive Coulomb, electron-ion-Pd effective, nuclear three-body short range) [1] and added a nuclear three-body long range force (3BLF) [2].

The electron's degrees of freedom are frozen for the three-body calculation. However, parameters of electronion-Pd effective potential are fitted to energies of $E_{\rm gd}^{\rm mol}$ and $E_{\rm 1st}^{\rm mol}$ which were obtained by the electron based Kohn-Sham equation. Several three-body resonance states are obtained, where the nuclear three-body La resonances strongly interfere with the three-body CsH₂ molecular resonances. We found that the E2 transition times from four ion oscillation (IOS) states $J^{\pi} = 7/2^+$ to the La ground state $J^{\pi} = 7/2^+$ are very short with $\tau \approx 10^{-1} \sim 10^{-6}$ [sec], for the five traditional potentials and $\tau \approx 10^{-2} \sim 10^{-8}$ [sec] for the six potentials. For the the CsH₂ ground state $\tau \sim 10^{24}$ [sec] and the first excited state $\tau \sim 10^4$ [sec] which are very stable. Our ultra-low energy critical values C_{low} = (density)×(energy)×(duration-time)= 7.50 × 10^5 [sec·Pa] $\sim 1.75 \times 10^{10}$ [sec·Pa] are almost the same as the critical values of *thermal nuclear fusion*: C_{high} = (density)×(energy)×(duration-time)=1.16 × 10^6[sec·Pa] or more.

[1] T. Watanabe, Y. Hiratsuka, M. Takeda, S. Oryu, N. Watari, H. Kakigami, I. Toyoda, J. Phys. Commun. **{6**} 045003 (2022).\\

[2] Shinsho Oryu, J. Phys. Commun. [6] 015009 (2022).

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