My name is Bond, Positron Bond!

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Recently, some of us conducted a study on the energy stability of a unique type of positronic molecule [1]. This molecule consists of two hydride anions that would normally repel each other, but with the addition of one positron ($e^+[H_2^{-2}]$), a stable configuration is formed. This discovery has sparked significant interest in the scientific community, leading to investigations into the energy stability of other positron-bonded diatomic systems, such as $2e^+[H_2^{-2}]$ [2], $3e^+[H_2^{-2}]$ [3], and homo- and heteronuclear $e^+[X^-Y^-]$ compounds involving halide anions (X, Y = F, Cl, Br) and one positron [4].

In this presentation, we delve into the analysis of a novel matter-antimatter molecular species composed of two positrons and three hydride anions, namely $2e^+[H_3^{-3}]$ [5]. Our study provides compelling evidence that the repelling trihydride system $[H_3^{-3}]$ can be stabilized through the formation of a three-center two-positron bond. Interestingly, the $2e^+[H_3^{-3}]$ system shares similarities with the purely electronic counterpart, the $[Li_3^+]$ trication, which is held together by two electrons. Despite comparable physical data, such as molecular symmetry, internuclear distance, vibrational parameters, and ground-state positron density at the internuclear region, the data on bond energies suggests that positron bonding is somewhat weaker than electronic bonding in trication systems.

References

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