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The production of the molecules in high energy collisions

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In the last two decades, many of the resonances observed in high energy collisions are incompatible with the traditional quark model, and those resonances are called the exotic states.
We depict those exotic states as the hadron-hadron molecule states and estimate the cross section for the production of the molecules in high energy collisions.
We predict a ground-state D^+D^- hadronic atom $A_{D^+D^-}$, called dionium with quantum numbers $J^{PC} = 0^{++}$, and estimate the cross section for the inclusive prompt production of the dionium at CMS and LHCb and the direct production $p\bar{p} \to A_{D^+D^-}$ at PANDA. We expect that $calO(10^3 \sim 10^5)$ events can be collected in the reaction $p\bar{p} \to A_{D^+D^-} \to K^-\pi^+K^+\pi^-$ at PANDA.
Besides, we also predict the inclusive production of the double charm meson-meson, hidden charm meson-baryon, and hidden charm baryon-antibaryon molecules in ep collisions. In particular, we estimate the cross section for the production of the $\Xi_c\bar{D}^{(*)}$ and $\Lambda_c\bar{\Lambda}_c$ molecules are at $calO(100)$ pb in the Electron-Ion Collision (EIC), while that of cross sections are at $calO(1)$ pb for the Electron-ion collision in China (EicC). The cross sections for the production of P_c states are at $calO(0.1)$ pb at CEBAF 24 GeV.

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