

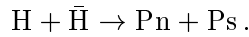
Atom - Antiatom Interactions

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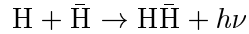
Abstract

The fate of antihydrogen in contact with ordinary atoms will be discussed. We will present the cross sections for various elastic and inelastic atom - antiatom collisions at ultra low energies. The cross sections are obtained by means of the quantum mechanical calculation of transition amplitudes using distorted wave approximation based on the adiabatic interaction potential. We present an extension of this approach to the coupled channel treatment involving complex optical potential.

We show that in the case of *hydrogen - antihydrogen collisions* a considerable loss of antihydrogen atoms occurs through the rearrangement reaction leading to formation of protonium and positronium

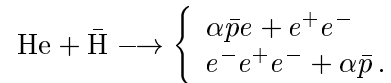


Furthermore we present the cross sections for the proton - antiproton and electron - positron annihilations in flight ($\text{H} + \bar{\text{H}} \rightarrow xx + e^+ + e^-$, $\text{H} + \bar{\text{H}} \rightarrow yy + p + \bar{p}$) and for the radiative association process



leading to formation of a metastable molecule $\text{H}\bar{\text{H}}$. We predict the characteristic photon spectrum resulting from the formation of $\text{H}\bar{\text{H}}$ in various ro-vibrational states and calculate the lifetimes of these states.

We also discuss the case of *antihydrogen - helium collisions*, with particular emphasis on the rearrangement process leading to formation of antiprotonic helium



First estimations of the cross sections for the elastic $\bar{\text{H}} + \text{He}$ collisions and the in-flight $\alpha - \bar{p}$ annihilation are presented. We investigate if and how the reactions mentioned above are influenced by the fact that, in contradistinction to the $\bar{\text{H}} + \text{H}$ case, the $\bar{\text{H}} + \text{He}$ interaction potential is *not* purely attractive.

Implications for collisional cooling, trapping and detection of antihydrogen will be discussed.