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Polarized H₂, D₂ and HD molecules and their possible use to feed a polarized H₂⁺, D₂⁺ or HD⁺ ion source for stripping injection into storage rings

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With a dedicated apparatus it was shown that the nuclear polarization of hydrogen atoms and its isotopes, produced by a polarized atomic beam source (ABS), can be preserved during the recombination into molecules. In this way, polarized H₂ and D₂ molecules in hyperfine substates where both nucleons have the same nuclear spin are generated. In more recent experiments the ABS was used to determine the spin of hydrogen and deuterium atoms passing through in parallel. Thus, the nuclear spins of the protons and the deuterons can be determined separately to get HD molecules in any hyperfine substate, i.e. in any spin combination. One application of this technique can be the design of an intense H₂⁺, D₂⁺ or even an HD⁺ polarized ion source for stripping injection at storage rings like COSY with polarization values above 0.8 and intensities in the 10-100 μA range.

Category

Polarized Sources

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