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Polarized H_2 , D_2 and HD molecules and their possible use to feed a polarized H_2^+ , D_2^+ 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 H_2 and D_2 molecules in hyperfine substates where both nucleons have equal spins are generated. In more recent experiments the ABS was used to determine the spin of hydrogen and deuterium atoms passing through in parallel. In this case, 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 H_2^+ , D_2^+ or even an HD^+ polarized ion source for stripping injection at storage rings like COSY with polarization values above 0.8 and continuous intensities in the 10 μ A range.

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