Evaporative Cooling and BEC in Hydrogen

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Abstract

The first search to observe BEC in spin-polarized hydrogen employed confinement in cryogenic cells. Progress was halted abruptly with the recognition that three-body recombination blocked these approaches to BEC: at higher temperatures, volume recombination was prohibitive; at lower temperatures, recombination on the cryogenic surface was prohibitive. Switching to the high-field seeking states and employing a pure magnetic trap made surface-free confinement possible but required a new cooling method. We demonstrated that by lowering the depth of the trap, the more energetic atoms would escape and as the gas rethermalized its temperature would drop. Subsequently we switched to rf evaporation, which greatly improved the cooling efficiency. The process turned out to be extremely well suited to the alkali metal atoms where it enabled the first observation of BEC in a gas. Several years later, it enabled us to observe of BEC in hydrogen.

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