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BEC of Potassium-41: towards creation of ultracold polar molecules JUN KOBAYASHI, The University of Tokyo, TETSUO KISHIMOTO, The University of Electro-Communications, KAI NODA, KIYOTAKA AIKAWA, The University of Tokyo, MASAHITO UEDA, JST, ERATO and Tokyo Institute of Technology, SHIN INOUYE, The University of Tokyo and JST, ERATO — One of the major goals in the field of ultracold gases is the production of ultracold polar molecules. Due to anisotropic, long-range interaction, a polar molecular gas is expected to show us a rich variety of new phenomena, including anisotropic collapse and a super-solid phase. We work with a two-species ultracold atomic gas of ^{41}K and ^{87}Rb. We successfully produced a BEC of 2×10^5 ^{41}K atoms. A BEC of ^{41}K was first realized by the LENS group[1]. However, since that experiment was based on sympathetic cooling with ^{87}Rb, the characteristics of ^{41}K under evaporative cooling were unknown. Furthermore, producing a high phase-space density ^{41}K cloud by laser cooling alone was expected to be difficult because of the small hyperfine splitting of the excited states (13MHz). We show that compressed-MOT and Doppler cooling stages are essential for achieving a 100uK cloud with a number density of $5 \times 10^{10}\mathrm{cm}^{-3}$. Typically, 9×10^8 atoms are loaded in a magnetic trap. We see a difference in efficiency of evaporative cooling using an rf-transition between magnetic sublevels and between hyperfine states. The underlying physical mechanism is discussed. [1] G. Modugno et al., Science 294, 1320 (2001).

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