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Demonstration of a magneto-optic trap formed using a reversible, solid-state electrochemical Rb device SONGBAI KANG, KAITLIN MOORE, JAMES MCGILLIGAN, NIST, RUSSELL MOTT, ALLISON MIS, CHRIS ROPER, HRL laboratory, ELIZABETH DONLEY, JOHN KITCHING, NIST, HRL LABORATORY TEAM — Fast, reversible, low-power alkali-atom sources are desirable for both tabletop cold-atom experiments and portable cold-atom-based sensors. Previously, the alkali-atom sinking and sourcing functions of such a device have been demonstrated only in hot-atom applications[1]. In this work, we demonstrate the first rubidium (Rb) cold-atom magneto-optic trap (MOT) using this type of solid-state device. Unlike past efforts[2,3], the number of emitted Rb atoms is linearly dependent on current applied across the device and saturates the MOT number irrespective of vapor-cell material and geometry, while also consuming less than 1 mW of electrical power to regulate the alkali-atom number. Significantly, this device can also sink and store Rb atoms controllably. Measurement results show that the sinking time constant is at least as fast as 500 ms. Lastly, we demonstrate an order of magnitude suppression of MOT-number fluctuations by providing feedback to the device. The core technology of this device translates readily to other alkali and alkaline-earth elements that find a wide range of uses in cold-atom systems. [1] S. Kang et al, APL 110, 244101 (2017) [2] C. Klempt et al, PRA 73, 013410 (2006) [3] L. Torralbo-Campo et al, Nat. Sci. Rep. 5, 14729 (2015)

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