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Circular Dichroism of Dense Alkali Vapors THAD WALKER, EARL BABCOCK — Spin-Exchange Optical Pumping (SEOP) of He-3 utilizes high density (10^{14}-10^{15} cm^{-3}) alkali vapors to enable manageable spin-transfer rates to He-3 of on the order of a few hours. For cells of a few cm in length, this implies that the vapors are typically 100 optical depths thick at line center. Successful optical pumping requires that the vapor become transparent when fully polarized. Recent experiments on SEOP with alkali mixtures showed that the key factor limiting the conversion of light angular momentum into polarized He-3 spins is the failure of the atoms to become fully polarized even in the presence of intense pumping light. This effect lowers the spin-exchange efficiency by typically a factor of 10. To study this effect further, we have measured the circular dichroism of Rb-He vapors in the vicinity of the D-lines. The measurements indicate that near the 795 D1 resonance the dichroism is substantially smaller than normally expected. A natural explanation is that the He buffer gas mixes the Rb fine-structure levels, allowing for fully polarized atoms to continue to absorb light. This work is supported by the Department of Energy.

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