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A study of Rb hyperfine polarization at submicron distance from glass surfaces[1] K. ZHAO, Z. WU, Department of Physics, Rutgers University — We study *regionally specific* hyperfine polarization $\langle \boldsymbol{S} \cdot \boldsymbol{I} \rangle$ of Rb atoms at submicron distance from coated and uncoated Pyrex glass surfaces in optical pumping cells. This is in contrast to the previous hyperfine polarization studies, where the quantity measured is the bulk hyperfine polarization, which depends on surface interactions *averaged over the entire cell surfaces*. We probe the hyperfine polarization of the Rb atoms in the vicinity of cell surfaces using the evanescent wave of a weak laser beam. We find that the polarization in the vicinity of uncoated surfaces is significantly lower than that in the bulk. The polarization decreases rapidly with decreasing distance from the surface. By contrast, the polarization in the vicinity of a silicone coated Pyrex glass surface is independent of the distance from the cell surface and is equal to the bulk polarization. Regionally specific measurement of the hyperfine polarization as a function of the penetration depth of the evanescent wave allows us to deduce the hyperfine polarization, its normal gradient, as well as the normal gradient coefficient $\mu_{\boldsymbol{S}\cdot\boldsymbol{I}}$ at the cell surface. We also demonstrate that hyperfine polarization at submicron distance from the cell surface can be used as a novel way to quantify and map the regional quality of the coatings inside optical pumping cells.

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