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Large Production of Hyperpolarized 129-Xe for MRI Applications IULIAN RUSET, F.W. HERSMAN, JAN DISTELBRINK, STEPHEN KETEL, SILVIU COVRIG, IGA MURADIAN, ADRIAN SINDILE — Although 129-Xe was the first hyperpolarized gas to be used in MRI studies, the research community has focused on 3-He, mainly because of the larger quantities of hyperpolarized gas available. Xenon has advantages over helium, such as natural abundance, lower diffusion, and high solubility in blood. It presents a large frequency chemical shift when dissolved in blood, tissue, brain, or trapped in molecular cages. A new design of a high-flow low-pressure spin-exchange optical pumping Rb-Xe polarizer was recently demonstrated by our group. The concept of counterflowing the gas mixture against laser light and dividing the polarizing cell in three operational zones has resulted in an increase with over an order of magnitude in the output magnetization compared with previously reported polarizers. We were able to produce hyperpolarized xenon at 64% polarization for 0.3 liters/hour flow rate and 22% polarization at 6 liters/hour. We also demonstrated a new design of freezing and thawing hyperpolarized xenon with minimum losses. We will present the concept of the high-flow low-pressure counterflowing xenon polarizer, its performance, as well as new optical pumping laser technologies. We will discuss optimization plans for xenon polarizing systems based on experimental observed limitations and theoretical modeling.

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