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Development of a barium tagging sensor for NEXT neutrinoless double beta decay searches

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Demonstration of a highly efficient single ion barium tagging sensor could reduce backgrounds in searches for neutrinoless double beta decay ($0\nu\beta\beta$) to negligible levels in ton to multi-ton scale experiments. The NEXT collaboration is pursuing a phased program to search for $0\nu\beta\beta$ using high pressure xenon gas time projection chambers. The implementation of single ion barium tagging sensors is a possible new technology to enhance the sensitivity of xenon gas detectors. In this talk, I will present recent developments based on single molecule fluorescence imaging (SMFI) using a novel high pressure gas microscope and custom-engineered organic fluorophores for dry functionality and an in-situ barium ion beam for sensor testing. This prototype sensor serves as a first of its kind for integration into a future barium tagging high pressure xenon gas TPC experiment.

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