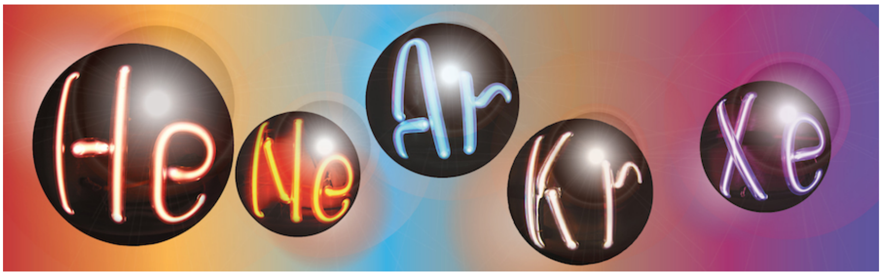

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Stabilization of High-concentration Xenon Doping in Liquid Argon

Friday, 23 September 2022 09:30 (15 minutes)

Doping liquid argon with small ($< 0.1\%$) concentrations of xenon improves its performance as a detection medium by shifting primary scintillation light to longer wavelengths. At high doping levels, the concentration of xenon in the gas phase is sufficient to modify the electroluminescence chemistry analogously to that of the primary scintillation. However, conventional cryostat and circulation designs of liquid argon TPCs lead to unwanted concentration and separation of the xenon, even at small doping levels. We describe the successful operation of a system specifically designed to thermodynamically stabilize xenon-argon mixtures. This method allows mixtures to be stabilized for multiple days without separation, with operation demonstrated at 2% concentration. Consequently, the S2 light of dual-phase TPCs using this mixture can be conveniently sensed at longer wavelengths and over shorter timescales, allowing for more efficient detection of low-energy ionization signals.

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