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Electron Recoil Bubble Nucleation in PICO Bubble Chambers

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The primary advantage of the bubble chamber technology for dark matter detection, as used by the PICO collaboration, is its simultaneous sensitivity to nuclear recoils from dark matter interactions and insensitivity ($\sim 10^{-10}$) to electron recoil backgrounds. Previously published data in CF₃I indicated that the probability of nucleation for a single electron recoil scales with the thermodynamic threshold of the detector. More recent calibrations in C₃F₈ suggest that this may not be the case, indicating that the nucleation mechanisms in the two fluids may be different. I present separate nucleation models for energy deposition in C₃F₈ and on heavy atomic targets like iodine. These models fit existing PICO calibration data reasonably well, and should allow for more accurate prediction of electron recoil background rates in future PICO dark matter searches.

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