

Abstract Submitted
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Design and Operation of Cryogenic Distillation Research Column for Ultra-Low Background Experiments¹ CHRISTOPHER CHILLER, ANGELA ALANSON CHILLER, BENJAMIN JASINSKI, NATHAN SNYDER, DONGMING MEI, University of South Dakota — Motivated by isotopically enriched germanium (^{76}Ge and ^{73}Ge) for monocrystalline crystal growth for neutrinoless double-beta decay and dark matter experiments, a cryogenic distillation research column was developed. Without market availability of distillation columns in the temperature range of interest with capabilities necessary for our purposes, we designed, fabricated, tested, refined and operated a two-meter research column for purifying and separating gases in the temperature range from 100-200K. Due to interest in defining stratification, purity and throughput optimization, capillary lines were integrated at four equidistant points along the length of the column such that real-time residual gas analysis could guide the investigation. Interior gas column temperatures were monitored and controlled within 0.10K accuracy at the top and bottom. Pressures were monitored at the top of the column to four significant figures. Subsequent impurities were measured at partial pressures below 2E-8torr. We report the performance of the column in this paper.

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