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Depletion of 39Ar in Natural Argon Gas Using a Multiple-Port Thermal Diffusion Column DAVID SMITH, South Dakota School of Mines and Technology — This project aims at providing argon depleted of 39Ar by utilizing established thermal diffusion methods for isotopic separation. The depleted argon can then be used as a target material for next generation large-scale dark matter detectors. Thermal diffusion exploits an established temperature gradient to produce a concentration gradient along the length of a vertical column. In this concentration gradient, heavier isotopes will accumulate at the bottom of the column, while the lighter isotopes will rise to the top. Though this technique has existed for over 50 years, little research has been conducted on investigating the distribution of concentration gradient along the length of a thermal diffusion column. A three-meter thermal diffusion column with seven sample ports has been assembled and operated at the University of South Dakota. With this column, information is being gathered about how the isotope separation factor varies along a three-meter length and how fast the separation will reach an optimal level. Preliminary tests have shown that this multi-port column can produce separation factors similar to a thermal diffusion column of the same length without multiple ports. The experimental results are being compared to a theoretical model.

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