

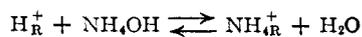
A LABORATORY METHOD FOR SEPARATING NITROGEN ISOTOPES BY ION EXCHANGE¹

Sir:

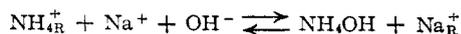
A study of factors involved in clean-cut separation of adjacent rare earths on ion-exchange columns suggested that perhaps isotopes could be separated by this method. In the case of the rare earths, it was found that the best results were obtained when an adsorbed band was eluted down a column in an "equilibrium type band."² This type of band is obtained when the eluant contains anions which tightly complex the rare earths and where sharp chemical constraints are imposed at the front and rear edges of the band. Under these conditions sharp slug-type bands of the individual rare earths form and ride head to tail down the column with all their boundaries traveling at the same rate.

While isotopic exchange constants are smaller than the exchange constants for adjacent rare earths, a study of theory³ suggested that isotopes might be banded if the band was eluted a greater distance. Since lighter elements have larger isotopic exchange constants, the first experiments were conducted using nitrogen in the form of ammonia.

A bank of 4" X 5' columns, filled with sulfonated cation-exchange resin in the hydrogen cycle, were connected in series. Five liters of 15 N NH₄OH, diluted 30-fold and adsorbed on the columns, gave a band 10 feet long. The band had a sharp front due to the reaction.

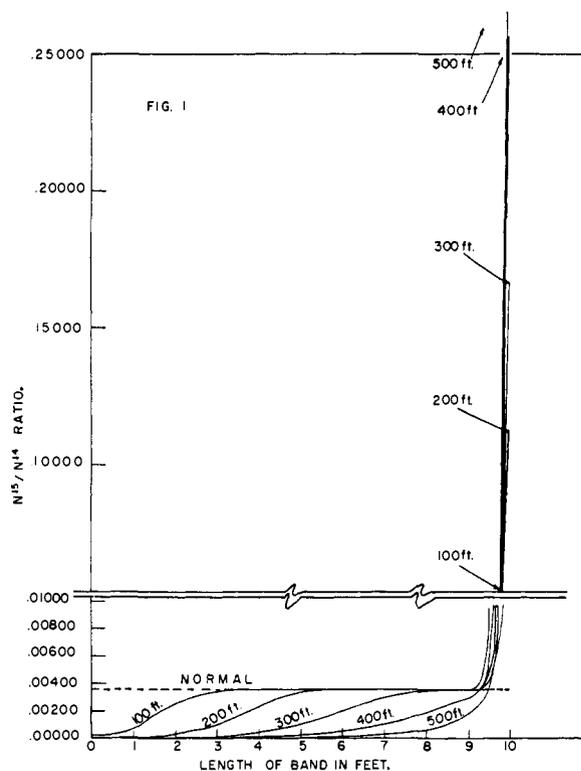


In order to maintain a sharp rear boundary the band was eluted with 0.5 N NaOH, the reaction being



When the ammonia band moved off a column the sodium resin was reconverted to hydrogen resin. In this manner the ammonia band could be eluted around the bank of columns for as many band displacements as desired. Figure 1 shows how N¹⁵ concentrated at the rear edge of the band. After traveling 50 band lengths most of the N¹⁵ was concentrated in the last six inches of the band. The isotopic ratio, N¹⁵/N¹⁴, of the original adsorbed ammonia was 0.00365. After 50 band displacements the ratio at the front edge of the band usually dropped to 0.00020 and in some experiments to as low as 0.00006. The first 90% of the ammonia recovered had an average isotopic ratio less than 0.00050. The isotopic ratio at the rear edge averaged better than 0.25.

When the last 2% of the ammonia from such a run was adsorbed on 1-in. columns and eluted an additional 100 feet, the mole per cent. of N¹⁵ at the rear edge exceeded 74%. Good results were obtained at flow rates which produced a band move-



ment anywhere from a fraction of an inch to 30 inches per hour.

The authors received assistance from various members of the Laboratory, particularly Mr. Jack Evans, Mr. Douglas Provow and Miss Anne Harmon, in the operation of the columns and Mr. Rodney Harrington and Mr. Jennings Capellen in the analysis of the nitrogen.

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YEAST ALCOHOL DEHYDROGENASE, A ZINC METALLOENZYME

(Correction)

Sir:

An unfortunate error occurred in the "Communication to the Editor" under the above title published in THIS JOURNAL, 77, 821 (1955). The sentence ending paragraph 1, page 822, should read: "Preparations which had as little as 25 μg. of magnesium per gram of protein have full activity."

Since the sentence in the previously published form is obviously inconsistent with and alters the sense of the communication, an early correction of this error seemed mandatory.

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(1) Work was performed in the Ames Laboratory of the Atomic Energy Commission, Ames, Iowa.

(2) (a) F. H. Spedding and J. E. Powell, THIS JOURNAL, 76, 2545 (1954); (b) F. H. Spedding, E. I. Fulmer, J. E. Powell, T. A. Butler and I. S. Yaffe, *ibid.*, 73, 4840 (1951).

(3) F. H. Spedding and J. E. Powell, *ibid.*, 76, 2550 (1954).