A LABORATORY METHOD FOR SEPARATING NITROGEN ISOTOPES BY ION EXCHANGE[1]

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 theory[3] 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″ × 5′ columns, filled with sulfonated cation-exchange resin in the hydrogen cycle, were connected in series. Five liters of 15 *N* NH_4OH, diluted 30-fold and adsorbed on the columns, gave a band 10 feet long. The band had a sharp front due to the reaction.

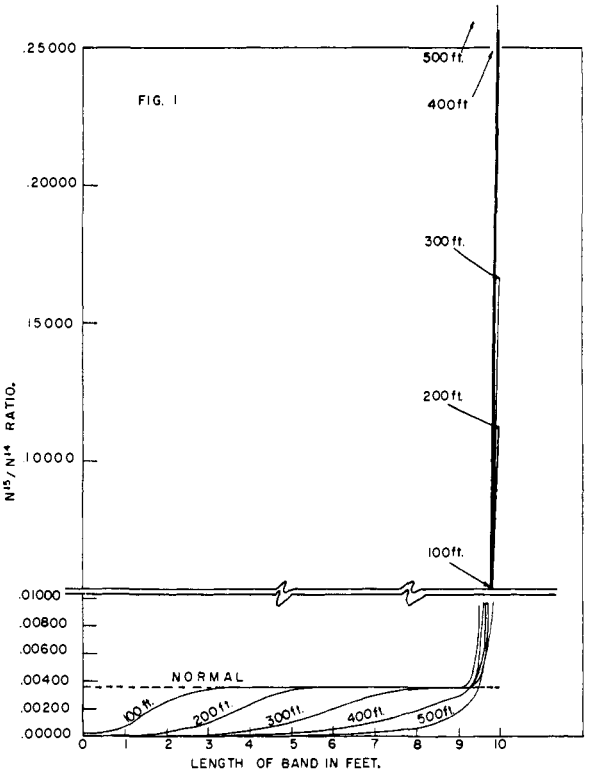
$$H_R^+ + NH_4OH \rightleftharpoons NH_{4R}^+ + H_2O$$

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

$$NH_{4R}^+ + Na^+ + OH^- \rightleftharpoons NH_4OH + Na_R^+$$

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 N^{15} concentrated at the rear edge of the band. After traveling 50 band lengths most of the N^{15} was concentrated in the last six inches of the band. The isotopic ratio, N^{15}/N^{14}, 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 N^{15} at the rear edge exceeded 74%. Good results were obtained at flow rates which produced a band movement anywhere from a fraction of an inch to 30 inches per hour.



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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).

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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