Exchange Reactions of Protium and Deuterium

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LETTERS TO THE EDITOR

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Exchange Reactions of Protium and Deuterium [1]

Investigations concerning the chemical nature of deuterium have been in progress for some time. The adequate analysis of small amounts of deuterium-rich hydrogen has proved of considerable difficulty, but the interest in the properties of deuterium justifies this preliminary notice.

A sample of water containing one percent deuterium[2] was circulated with ordinary hydrogen by means of a mercury jet pump through a quartz tube at 800°C for several days. The hydrogen was then freed from the original water by liquid air traps and phosphorus pentoxide. Photographs of the atomic discharge of this hydrogen and of ordinary hydrogen were made on the 21-foot grating. The discharge tube was swept out repeatedly with air and then run with several fresh samples of ordinary hydrogen. The deuterium line $H^2\beta$ was about one-fourth the intensity of the fourth order ghost from the protium $H^1\beta$. The discharge tube was then run with several samples of the prepared hydrogen. The deuterium $H^2\beta$ of this hydrogen was of greater intensity than the fourth order ghost from $H^1\beta$. No effort was made to estimate the concentration of deuterium as experiments are in progress with more concentrated samples of water and better analytical methods. These experiments deal with the nature of the exchange reported here as well as the atomic metathesis of this and other suitable reactions.

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[1] These names have been proposed for the ordinary hydrogen atom and the isotope by Urey, Brickwedde and Murphy, J. Chem. Phys. **1**, 512 (1933).

[2] This was kindly supplied by Professor H. C. Urey.