the Chevalier Philippe de Fay, the truest of Dolomieu's friends, to Picot de la Peyrouse, botanist and geologist of Toulouse, to the great geologist Saussure, to the Genevan physician Pictet, to Pierre Picot, professor of theology in Geneva, and to Frederic Munter, professor of theology in Copenhagen.

The following extract from a letter to this last named correspondent, is a characteristic example. Dolomieu, after passing safely through the throes of the French Revolution, was appointed, in 1796, lecturer in geology and the distribution of minerals at the newly-organized Ecole des Mines. A year later, Jan. 15, 1797, he writes to his friend Munter:[1]

"The sciences, which were for me formerly a relaxation, have become a profession which furnishes me the means of livelihood, and none the less I cultivate them with pleasure. I am chiefly occupied with mineralogy and geology, and I give lessons in these branches at the Ecole des Mines during the winter. During the summer I travel to inspect the mining operations. I have assumed charge of the mineralogical articles of the Dictionnaire Encyclopédique, and I write articles which are published in various journals. Thus I employ my time in a manner agreeable to myself and I advance without much disquietude toward that fatal term against which all human hopes make shipwreck. We have become so accustomed to the idea of death, that we now see our last hour approaching with complete indifference."

The biographical sketch already noted is reprinted by Professor Lacroix at the beginning of the first volume of the present work (pp. i—lxxx). To this succeeds the unique record written by Dolomieu in 1799, in his prison at Messina, where he was incarcerated because of his supposed guilt, as a Knight of Malta, in aiding Bonaparte to seize the island. It was inscribed on the margins of the leaves of a book he had succeeded in obtaining, and which is now a precious possession of the Muséum d'Histoire Naturelle (pp. 1-44). The quality of this record may be exemplified by the following brief extract:

"My passion for the phenomena of Nature was so strong that every year, when spring renewed the life of the vegetable kingdom and gave new force to all organized beings, the environs of Paris seemed too restricted for me, its atmosphere heavy and offensive . . . . Therefore each year I hastened to the mountains, and sought on their summits those profound emotions which the contemplation of very great objects always procures us . . . Now, confined within a space of twelve feet long, and ten feet in height and width, I can only contemplate my own wretchedness and reflect upon the vicissitudes of fortune and my strange destiny."

Fortunately the Italian victories of Bonaparte opened his prison doors, his liberty being prescribed in one of the articles of the peace treaty of Florence, March 20, 1801. However, his enfeebled health did not long permit him to enjoy his recovered freedom. He died at Chateauneuf, November 6, 1801, but fifty-one years old.

Of Dolomieu's scientific attainments, Professor Lacroix notes that it was principally in the study of volcanic phenomena that he left his trace, and asserts that by his researches concerning Auvergne, he takes his place in the first rank of those who have recognized and demonstrated the relations existing between volcanism and the internal heat of the earth.

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[1] Vol. II, p. 138.

SPECIAL ARTICLES

DISSOCIATION OF HYDROGEN IN A TUNGSTEN FURNACE AND LOW VOLTAGE ARCS IN THE MONATOMIC GAS

IN the course of an investigation of arcing characteristics of diatomic gases being carried on in this laboratory, it was found that the arc between a hot tungsten filament and a plate anode in hydrogen struck and broke at a minimum of 16.4 volts. This potential is about that ascribed by Bohr's theory to the potential necessary to accelerate an electron so that it will dissociate the molecule and ionize one of the atoms upon impact. In view of the fact that Bohr's theory puts the ionizing potential of the hydrogen atom at 13.52 volts and the radiating potential at 10.14 volts, it seemed that it should be possible to maintain an arc at 13.52 volts or even as low as 10.14 volts. The failure to maintain an arc at these potentials was ascribed to the insufficient amount of monatomic hydrogen in the tube.

During the course of this investigation, Professor K. T. Compton suggested that it might be possible to dissociate hydrogen by means of a cylindrical tungsten furnace which could also be used as one of the electrodes for the arc. The writer undertook the investigation of the possibility of this and computed the per cent. of monatomic hydrogen which would be in equilibrium with the diatomic gas on the basis of Nernst's equation of the "reaction-isobar."[1]. Taking the heat of dissociation to be 84,000 calories per gram, $\beta = 0.000225$, and the chemical constants for the diatomic and the monatomic hydrogen to be[2] -3.4 and -1.6 respectively, the per cent. of monatomic hydrogen in equilibrium with diatomic hydrogen is indicated in the following table:

Pressure	1000° K	1500° K	2000° K	2500° K	3000° K
0.5 mm.	.005	2.36	61.5	Complete	
1.0 mm.	.004	1.69	40.0	98.8	
5.0 mm.	.002	0.74	26.7	90.4	Dissociation

As it is possible to obtain a temperature of more than 2000°K in a tungsten furnace, it seemed that a sufficient amount of monatomic hydrogen could be obtained to maintain the arc at the lower potentials.

The furnace consisted of a cylinder of thin sheet tungsten, furnished by the General Electric Company, mounted on water-cooled leads and heated by means of an electric current. A tungsten filament ran axially through the furnace and was also heated by a current. The fall of potential in the furnace and that in the filament were in the same direction and of nearly the same amount. A potential was applied between the furnace and the filament, and was tried in both directions. The potential of the arc was corrected to the amount between the middle of the two electrodes. Gas pressures of 0.6, 0.8 mm, 1 mm, and 2 mm were used.

When the furnace was not heated the arc could not be maintained below the 16.4 volt point. When the temperature of the furnace was raised, a point was reached at which the arc would strike at about 16.6 volts and break at about 14 volts, indicating that the increased dissociation in the arc raised the percentage of monatomic gas sufficiently so that the arc could be maintained to approximately the ionizing potential of the atom. At still higher furnace temperatures the arc could be made to strike and break at about 13.5 volts and the results when plotted showed also unmistakable evidences of ionization at about 10.3 volts. Curves were obtained showing three sharp breaks in the neighborhood of 10.3, 13.2, and 16.2 volts. With the furnace at a very high temperature the arc would strike at about 14 volts and break at 11 volts. It seems certain that the arc struck at the ionizing potential of the atom and was maintained as low as the resonance potential of the atom. There was a considerable amount of tungsten "sputtered" on the walls of the tube, and from this it was concluded that the temperature of the furnace must have been 2000° to 2500° K. The results seem to indicate that the percentages of dissociated hydrogen calculated above are approximately correct.

These results constitute, it is believed, the first direct experimental proof of the correctness of the values of the radiating and ionizing potentials predicted by Bohr's theory for the hydrogen atom, and of the interpretation of the ionizing potential of the molecule as due to its dissociation plus the ionization of one of the atoms.

A complete report of these experiments will be published later. The apparatus will also be used to study the arcs in other gases and for investigating the excitation of the spectra of substances at high temperatures.

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JANUARY 26, 1922

[1] Nernst: Theoretical Chemistry.

[2] Reiche: Ann. d Physik, 58, p. 657, 1919, and Shames: Phys. Zeits., 21, p. 41, 1920.