NOTE ON THE PREPARATION OF METALLIC LITHIUM¹

BY LOUIS KAHLENBERG

Up to the present time metallic lithium has been obtained by electrolyzing lithium chloride in the molten state. The reason why this metal can not be obtained from aqueous solutions by electrolysis is that it reacts with water, forming hydrogen and lithium hydroxide. It is evident that if a solvent for a lithium salt could be found upon which lithium does not act, the metal could be deposited from the solution by electrolysis, provided the solution proved to be an electrolyte.

Pyridine is a solvent of this kind. It will dissolve lithium chloride and thus form a solution that conducts electricity. The electrical conductivity of such solutions is slight as compared with that of aqueous solutions. It has been determined by St. v. Laszczynski and St. v. Gorski.² These investigators also attempted to precipitate the metal from the solution electrolytically. In their electrolytic cell they used a diaphragm in form of a porous cup which greatly increased the internal resistance; and the cathode they employed was a short platinum wire 1 mm in diameter, so that the current density was relatively high. The anode consisted of a platinum foil. They used a pressure of 100 volts in their experiment in order to get a sufficient current. The result was that they obtained merely a black crust that contained metallic lithium.

I have found that lithium may be obtained in white metallic form from solutions of lithium chloride in pyridine by electrolysis at room temperatures. The method of operation is the sim-

¹ From the "Wisconsin Engineer," 3, 2 (1899).

² Zeit. Electrochemie, 4, 290 (1897).

plest possible. It may be described as follows: A concentrated solution of lithium chloride in pyridine is placed in a beaker into which dip a carbon plate (anode) and a bright iron plate or foil (cathode). Platinum or some other metal may, of course, also serve as cathode, though when used as anode a metal (even platinum) is apt to be attacked and some of its substance carried over to the cathode. No diaphragm is necessary. With a difference of potential of but 14 volts between the electrodes, a current of from 0.2 to 0.3 ampere per 100 sq. cm. of cathode area will soon deposit a dense, well-adhering silver white coating of metallic lithium. The deposit thus obtained possesses all the well known physical and chemical properties of the metal.

Lithium, being an alkali metal that is not very plentiful in nature, has thus far not found use in practical life in the metallic form; nor are the indications at present such that it will be used in practice. Metallic lithium costs from three to five dollars per gram and is used only for scientific purposes, mainly perhaps as a sample for exhibition in connection with lectures on chemistry.

By means of the method just described the metal can readily be obtained from the relatively cheap chloride in quantities sufficient for most scientific purposes. The method of preparation, as well as the properties of the metal, can thus easily be demonstrated to a class of students in a short time with simple means.

The method has not as yet been studied with a view of determining the conditions under which the yield is best, or to answer the question as to how large a quantity of the metal can thus be prepared economically. It may be stated, however, that the difficulties in obtaining lithium in quantity from this solution are in general those that are met in separating metals from their solutions in large quantities by means of the electric current.

*Laboratory of Physical Chemistry, University of Wisconsin,
Madison, April 14, 1899*