

TECHNIQUE FOR MAKING COLLODION FILTER FOR THE K_{α} CHROMIUM RADIATION.

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ABSTRACT—Collodion filters of ammonium (meta) vanadate have been found very satisfactory in the obtaining of the K_{α} chromium radiation. This note describes the method of preparation, the concentration of vanadium which proved most suitable, and the satisfactory condition of operation of an X-ray tube in conjunction with such filters.

The methods for preparing the filters to obtain a monochromatic x-ray beam for purposes of crystal structure analysis, so far proposed, fall into two groups. If the filter element is in the form of a thin sheet, as for example, nickel foil for copper radiation, it is cut to the desired thickness and used as a filter. When the filter element is not obtainable in the above form however, as for example, vanadium, suitable filtering screens are made from a compound of the filtering element by one of the several ways. A filter paper may be soaked in the solution of a compound of the filtering element and dried; a compound of the filtering element may be mixed with another element of low atomic number and then spread on a sheet of paper coated with shellac; an element may be electro-deposited on an aluminium foil, as for example, manganese on aluminium for filtering iron radiation; and finally a compound of the filtering element may be suspended either in a paraffin block which may afterwards be cut to the desired thickness, or in collodion, which may be spread out in a thin sheet and allowed to dry.

Collodion filters of ammonium (meta) vanadate were prepared¹ by the latter method and have been found very satisfactory in the obtaining of the K_{α} chromium radiation. The method² of preparation, the concentration of vanadium which proved most suitable, and the satisfactory condition of operation of an x-ray tube in conjunction with such filters, are described below.

Mix 25 grams of well-powdered ammonium (meta) vanadate of technical grade $\{NH_4 VO_3, V \text{ (as } V_2O_5) 77.05; Fe_2O_3 0.025; SiO_2 0.05; Cl 0.10; SO_3 0.01; \text{alkali } 0.16\}$ with 40 c.c. of collodion of the flexible variety³ (24 per cent. alcohol, 72 per cent. ether) and 20 c.c. of 95 per cent. alcohol, and stir thoroughly.

Prepare several polished aluminium plates of $1'' \times \frac{1}{2}''$ size and half that many pieces of blotter of the same size. Take one of the plates and dip it into

the mixture, remove, allow to dry for a few seconds, turn it around and dip it again so that the end that formerly entered the liquid first, now enters last. Repeat the dipping until the desired thickness has been obtained. Set the coated plate aside. Treat the other plates the same way.

In less than an hour the coating will dry and peel off the plates. Put the coatings into a flat dish with alcohol in it. The alcohol will soften the coatings so that they can be spread out perfectly flat. Place a blotter on a plate and a coating on a blotter. Be sure that the coating is perfectly flat. Place another plate on the coating, clamp the whole assemblage and place it in an oven. Heat at about 80°C for half an hour to drive alcohol and ether out of the coating into the blotter. The coatings thus treated are the filters in the finished form. Cut the filter to the desired size with a razor blade.

To obtain the required temperature of 80°C an inexpensive oven was made from a stove pipe of 7 inches diameter and one foot length. One end of the pipe was tightly closed with a wooden base at the centre of which was screwed a lamp socket. The wires for the electrical connections to the socket were brought in through a narrow hole in the pipe near the base. The other end of the pipe was covered with a wooden top to which was attached a metal shelf for supporting the assemblages. The shelf was about 7 inches from the bottom of the oven. A hole was made through the middle of the top for the insertion of a thermometer. The outside of the pipe was covered with a thick asbestos covering.

When a 75 watt Mazda lamp was connected to the socket and operated at normal voltage, it heated the oven to the desired temperature in half an hour.

Collodion filters of 0.5 to 0.6 mm. thickness were used in making powder photograms of pyrrhotite with the K_{α} chromium radiation, which was supplied by a Phillip's type demountable x-ray tube equipped with an aluminum window of 0.0005 inch thickness. The tube was operated at 40 K.V. peak and the load current was 20 milliamperes.

REFERENCES.

- ¹ Sidhu, *Rev. Sci. Inst.* **8**, Aug. (1937).
- ² Kersten and Maas, *Rev. Sci. Inst.* **4**, 14, (1933).
- ³ This kind of collodion is made by Mallinckrodt Chemical Works, St. Louis, Mo. U.S.A.

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