

TEMPERATURE EFFECT IN BARIUM AND STRONTIUM PHOTO-ELECTRIC CELLS.

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SYNOPSIS.

Photo-electric Current from Treated Barium and Strontium Surfaces.—A metal plate mounted in an evacuated cell was outgassed by heating inductively and was then coated with barium or strontium. The large temperature effect previously reported was confirmed. At dull red heat the current from the two metals was found to be respectively 1,200 and 25 times as great as at room temperature.

IN the PHYSICAL REVIEW for March, 1921, in a brief: "New Strontium and Barium Photo-Electric Cells" the author mentioned the fact that the photo-electric current was increased about 100 times when the metal plate upon which the metallic barium was deposited was raised in temperature to just under a red heat. This was accomplished by passing a current through the metallic plate, but previously to coating with the active material the plate had not been entirely freed of gases, with the result that the barium was oxidized and the action spoiled, but not before the one hundred time increase had been observed. The resulting contamination and gas present made it doubtful as to whether the observed increase was due to a true temperature effect or not. Since then Merritt has also observed this effect on the oxide-coated filaments of audion bulbs.¹

Recently the construction of these cells has been refined and extremely careful precautions taken in freeing all the metallic parts of gas by raising them to a bright red heat until all traces of gas have disappeared. This has been accomplished by the induction furnace method which is ideal for this work. The metal plate is then coated with either barium or strontium as desired. It is now very simple to observe the temperature effect on the photo-electric current by inductively heating the plate from the outside of the vacuum bottle, and the cell does not spoil unless the plate is heated to such a bright red that the material is actually volatilized off the plate, in which case most of it goes over and is deposited on the opposite electrode. This occurs, however, only when the plate has been heated to a bright red.

With these arrangements the author has checked his previous finding of a large temperature effect in the case of barium and a much smaller

¹ Ernest A. Merritt, Photoelectric Phenomena in Coated Filament Audion Bulbs, PHYS. REV., April, 1921.

one in the case of the strontium. For strontium, the increase is only about 25 times at a dull red heat. The action is not spoiled as it previously was, because no gas is given off the plates. When these cells are giving their maximum photo-electric current under high temperature, there is not over .4 per cent. thermo-electric current if the light be turned off the cells.

The increase of photo-electric current is gradual with increase or decrease in temperature, as illustrated by observing the galvanometer deflection slowly decrease as the plate cools from a red heat. There are no sudden jumps in the photo-electric current curve, although it is impossible at present to tell whether the increase is directly proportional to the temperature or not until a cell has been constructed with a thermo junction on the plate so as to get an accurate temperature curve.

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