Patented Sept. 13, 1949 2,481,739

UNITED STATES PATENT OFFICE

2,481,739

RECTIFIERS

Mac Goodman, New York, N. Y., assignor to Radio Receptor Company, Inc., New York, N. Y., a corporation of New York

No Drawing. Application February 23, 1946, Serial No. 649,747

4 Claims. (Cl. 175—366)

1

This invention relates to improvements in barrier layers for selenium rectifiers and methods of producing the same.

Broadly, it is an object of this invention to provide a continuous film of amorphous selenium defining a barrier layer homogeneously distributed over and adherent to the crystalline selenium from which it is derived.

It has been well known in the art to treat an exposed surface of a selenium semi-conductive layer with an oxidizing agent or with a reagent which acts on the surface of crystalline selenium to form selenium dioxide or a salt of the treating composition, but such barrier layer is affected by atmospheric and operative conditions to make its action irregular.

It is an object of my invention to provide a barrier layer which I believe to be amorphous selenium, formed integral with the crystalline selenium body, whereby by virtue of the difference in characteristics of the semi-conductive crystalline selenium and the presumed amorphous selenium a relatively thin insulating but highly efficient barrier layer is formed.

In carrying out my treatment, I apply an oxidizing agent, as for example, hydrogen peroxide in a concentration of from 1% to 10% to which has been added a low concentration of from 2% to 5% of an organic reducing agent such as hydrazine or thio-urea. This solution of oxidizer and reducing agent is stable and may be applied to the exposed surface of the annealed semi-conductive selenium by spraying or dipping; upon drying it is found that a barrier of excellent resistance to high peak inverse voltages is developed. What I believe occurs in the spraying or dipping treatment aforementioned, is as follows:

The oxidizing agent acting preferentially in solution oxidizes the surface of the selenium exposed to it to form selenium dioxide which is immediately reduced by the organic reducing agent to form a deposit of amorphous selenium homogeneously distributed over the entire surface.

I have found in order to aid in the application of the aforesaid mixture of oxidizing agent and reducing agent that a wetting agent such as aerosol at a concentration of 5% or less is of advantage without in any way affecting the chemical reaction developed.

Although I have indicated hydrogen peroxide as a preferred oxidizing agent and hydrazine hydrate as a preferred reducing agent which when intermixed in solution do not interreact, it is

2

within the province of this invention to apply various oxidizing agents and reducing agents which do not interact with each other but which preferentially and successively act on the surface of the crystalline selenium to form a barrier layer, which may be presumed to be an integral surface layer of amorphous selenium homogeneously distributed. Among the oxidizing agents of the character above are potassium permanganate and calcium oxychloride, while among the soluble organic reducing agents are sugars and starches.

As usual, a counterelectrode material such as a eutectic alloy of cadmium, tin or bismuth is applied to the thus formed amorphous selenium surface of the selenium semi-conductive and thereafter electric current passed in reverse direction to electroform the barrier layer between the semi-conductive and the counterelectrode.

Various changes and modifications may be made to the details of the invention without departing from the broader spirit and scope thereof, as set forth in the following claims.

I claim:

1. A method for forming a barrier layer in a selenium type rectifier which comprises surface treating a crystalline selenium layer with a stable solution of an oxidizing and reducing agent which do not interact with each other, but which preferentially and successively act on the surface of crystalline selenium for forming by selective action an integral layer of amorphous selenium on the exposed surface of the crystalline selenium.

2. A method for forming a barrier layer in a selenium type rectifier which comprises treating a crystalline selenium layer with a stable solution of an oxidizing agent and a reducing agent which do not interact with each other, but which preferentially and successively act on the surface of crystalline selenium whereby in a selective and successive reaction the exposed surface of the crystalline selenium is oxidized to form selenium dioxide and thereafter reduced to form amorphous selenium, the thus formed layer being homogeneous in constituency and remaining integral with the crystalline selenium layer.

3. A method for forming a barrier layer in a selenium type rectifier which comprises surface treating a crystalline selenium layer with a stable solution of hydrogen peroxide and an organic reducing agent of a group consisting of hydrazine and thio-urea for forming by selective action an integral layer of amorphous selenium on the exposed surface of the crystalline selenium,

4. A method for forming a barrier layer in a selenium type rectifier which comprises treating a crystalline selenium layer with a stable solution of hydrogen peroxide in a concentration of 1% to 10% and an organic reducing agent of a group including hydrazine and thio-urea in a concentration of 2% to 5% whereby in a selective and successive reaction the exposed surface of the crystalline selenium is oxidized to form selenium dioxide and thereafter reduced to form amorphous selenium, the thus formed layer being homogeneous in constituency and remaining integral with the crystalline selenium layer.

MAC GOODMAN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,215,999	Brunke	Sept. 24, 1940
2,279,187	Thompson	Apr. 7, 1942
2,375,355	Lindblad	May 8, 1945