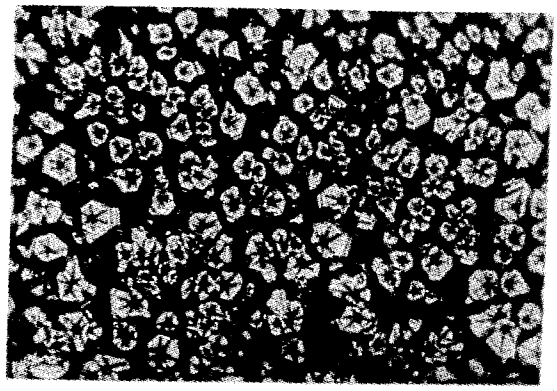
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GLASS PRODUCT AND METHOD OF MAKING THE SAME

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Emanuel Spielholz
Inventor
By Mocko Blum
Attorneys

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GLASS PRODUCT AND METHOD OF MAKING THE SAME

Emanuel Spielholz, New York, N. Y., assignor to Duro Test Corporation, North Bergen, N. J., a corporation of New York

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1 Claim. (Cl. 176—16)

My invention relates to a new and improved glass product and to a new and improved method of making the same.

The invention relates particularly to a glass lamp-bulb, the outer wall of which is preferably smooth, the inner wall thereof being roughened so as to provide a "frosted" effect. While the invention is not limited to the location of the frosted wall, it is preferable to have the outer wall of the bulb smooth and to have the inner wall irregular, according to standard practice.

Another object of the invention is to provide a glass bulb for an incandescent electric lamp, whose inner wall has been roughened by means of a single etching operation, and which will have high strength.

Another object is to provide a bulb having a glass wall made of glass of a special composition so that the interior wall can be roughened by means of a single etching operation which produces projections or irregularities having sharp corners.

Other objects of my invention will be set forth in the following description and drawing which illustrate a preferred embodiment thereof, it being understood that the above statement of the objects of my invention is intended generally to explain the same without limiting it in any manner.

It has been well known for many years to etch the inner wall of a glass bulb, in order to roughen said inner wall and to "frost" the bulb. Experience has shown that this etching operation has greatly weakened the wall of the bulb. It has been proposed to subject the inner wall of the bulb to two successive etching operations, in order to round the irregularities which have been formed by means of the first etching operation, and thus to increase the strength of the bulb.

According to the improved method a single etching operation, which leaves the irregularities with sharp corners, can be utilized.

While I do not wish to be limited to any specific formula for the composition of the glass wall of the bulb, I prefer to use a formula having the following ingredients, the proportions being by weight:

	Percent
Silica	65.5
Ferric oxide	0.5
Alumina	1.5
Lime	5.5
Magnesia	4.0
Spodumene	10
Soda	12
Potash	1

Many of these ingredients can be omitted or substituted by other ingredients and the proportions above given can be varied, as will be later more specifically stated. Many of these ingredients are conventional ingredients which have been used for many years in the manufacture of glass.

The important ingredient is spodumene, which is a natural mineral and which consists substantially of lithium-aluminum-meta silicate.

The important ingredient of the spodumene is believed to be the lithium compound and I therefore do not wish to be limited to spodumene as the source of the lithium compound and more particularly as the source of the lithium silicate.

The spodumene is used as a convenient source of the lithium compound which is compatible with the other ingredients, in order to make the glass. The mineral designated as spodumene is identified in Dana's "Mineralogy," published in the year 1915 by John Wiley & Sons, as having a formula of $LiAl(SiO_3)_2$.

The above ingredients in finely divided form are intermixed intimately and they are then melted so as to make glass in the usual manner. The bulbs are annealed, after they have been blown, in the usual manner.

The frosting or etching solution may consist of 500 grams of 60% hydrofluoric acid, 500 grams of ammonium bifluoride, 400 grams of soda ash and 250 grams of water. This etching solution is made up in the usual manner and it is sprayed or otherwise applied to the inner surface of the bulb, at a temperature of 150° F. During the etching treatment the bulb may be at normal room temperature of about 70° F. and the etching solution, prior to spraying or applying the same to the inner wall of the bulb, may be heated to a temperature of about 150° F. After the spray has been applied, the interior of the bulb is washed out by means of warm water in the usual manner. The thickness of the wall of the bulb is substantially between .037 inch (thirty-seven one-thousandths of an inch) to .060 inch (sixty one-thousandths of an inch). The usual thickness of the glass bulbs which have been frosted is from .020 inch (twenty one-thousandths of an inch) to .023 (twenty-three one-thousandths of an inch), so that the thickness of the glass wall of the bulb which is etched according to my invention, is much greater than the normal thickness.

The drawing is a micro-photograph, magnified 200 diameters, showing the irregularities of the inner wall of a bulb which has been etched according to my invention.

Likewise the improved article has projections shaped like facets which act like prisms in order to refract the light in all directions. Likewise, since these facets have substantial reflecting surfaces, there is a considerable amount of total reflection from the improved etched surface.

A usual distinguishing characteristic of the improved device which is made according to my

improved method, is that when the filament of the lamp is cold, and white light is passed through the glass wall of the bulb from an external source, colored fringes are observed, showing that the glass wall has a prismatic effect in dispersing the light so as to produce colored fringes. This depends upon the formula of the glass, since some glasses will not produce this effect.

When the improved lamp is energized or its filament is heated so as to emit light, this color effect is not perceptible.

The improvement applies to crater lamps or to glow lamps which have no filaments, as well as to lamps having filaments.

In order to get the best effect, the etching treatment is continued for about 15 seconds, while the etching fluid is forced upwardly through a vertical jet over which the bulb is placed with its mouth downwards. The bore of the jet through which the etching solution is forced is about one quarter of an inch in diameter. The jet of etching solution strikes the top of the bulb and the etching fluid flows down the inner wall of the bulb in the form of a thin layer which performs the etching operation. The etching fluid may be discharged from the jet at a pressure of about five pounds per square inch to ten pounds per square inch. The invention is not to be limited to these practical details, which are given only by way of example.

Likewise the claim for the improved product is not to be limited to the method of manufacture specified herein and said claim covers the article specified therein, irrespective of the method of manufacture.

The drawing represents a duplicate of a photograph which was taken when green light was transmitted through a portion of the wall of a glass bulb, with the etched surface facing the lens of the camera. A parallel beam of green light was used merely to bring out photographic contrast, because the glass body was substantially colorless. The period of exposure was sufficiently short to differentiate on the photographic plate, between the high spots and the low spots of the etched wall. Hence the white or light areas on the photograph corresponded to the high spots of the etched surface.

The drawing is a reproduction of a positive photograph or positive print. When the etching solution contacts with the glass, a compound is formed which recrystallizes. This crystallized material forms the projections and it produces the frosted effect. Whenever I refer in the claim to etched projections, I refer to projections which are secured by the reaction of the etching solution with the glass, so as to produce said crystallized compound. After the etching, the thickness of the glass wall varies, if the glass wall was of uniform thickness prior to the etching. In the drawing the light areas correspond to the positions of the high points or projections of the etched wall. However, said light areas on the positive need not necessarily correspond accurately to the shapes of the high spots. As shown in the drawing, the projections are located irregularly, instead of being arranged only along parallel lines.

I have shown a preferred embodiment of the invention but numerous changes and omissions can be made without departing from its spirit.

I claim:

A glass electric-light bulb having an irregular chemically etched and recrystallized surface, said surface having etched projections and also having etched portions intermediate said etched projections, said respective projections having surfaces which are sufficiently inclined relative to each other to refract white light which is emanated from a source which is external to said bulb so as to produce colored fringes, said projections being shaped to transmit the light which emanates from the interior of the energized bulb without the substantial production of colored fringes.

EMANUEL SPIELHOLZ.