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POLYSTYRENE SHEET MATERIAL

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This invention relates to the preparation of films or foils, and relates more particularly to the preparation of thin film or foil having a basis of polystyrene.

Polystyrene film or foil, hereinafter referred to as sheet material, is usually prepared by casting a solution of polystyrene in a hydrocarbon solvent such as benzene, toluene, xylene, or mixtures thereof on to a glass or metal surface and stripping the resultant sheet material from the casting surface. However, polystyrene sheet material prepared in this manner does not easily strip from the casting surface; tearing and "crazing" difficulties being often encountered. It is, accordingly, an important object of this invention to provide a process for the production of polystyrene sheet material which will be free from the foregoing and other disadvantages and which will be especially simple and inexpensive in operation.

Another object of this invention is the provision of an improved solution for use in the preparation of polystyrene sheet material which may be stripped from the casting surface without difficulty and without harmfully affecting the product.

Other objects of this invention will appear from the following detailed description and will be pointed out more particularly in the claims.

I have found that highly satisfactory, clear, flexible and easily stripping sheet material having a basis of polystyrene may be prepared by casting on to a surface a solution of polystyrene in a suitable solvent such as an aromatic hydrocarbon to which has been added a relatively small proportion of an alcohol which is substantially a non-solvent for the polystyrene, and subjecting the sheet material formed on the casting surface preferably to an elevated temperature to remove the solvent. The theory of operation of this process is not clearly understood. However, it is believed that the ease of stripping of the sheet material from the casting surface is due to a lubricating effect, possibly caused by a thin film of alcohol exuding on to the casting surface during the drying of the sheet material thereon.

Any suitable alcohol which is a non-solvent, or substantially so, for the polystyrene may be employed in accordance with my invention. However, the alcohols which I have found to give the optimum results are aliphatic monohydric alcohols containing at least five carbon atoms such as amyl alcohol, hexanol, octyl alcohol, undecanol and their isomers, polyhydric alcohols such as ethylene glycol, triethylene glycol and glycerine, and aromatic alcohols such as cyclopentanol, cyclohexanol and benzyl alcohol.

All of these alcohols are compatible with the polystyrene, but where too great an amount of the alcohol is employed it has a tendency to sweat out, or exude, from the sheet material, causing

some blushing. While the non-solvent alcohol may be employed in my process in amounts ranging from about 0.5% to 25% or more, based on the volume of the aromatic hydrocarbon or derivative thereof used as solvent for the polystyrene, with good results, I prefer to add from 1 to 5% of alcohol to the solvent.

While, as stated above, aromatic hydrocarbons such as benzene, toluene, xylene or mixtures thereof may be employed as solvents for the polystyrene in preparing the sheet forming solution, halogenated aliphatic or aromatic hydrocarbons may also be employed as solvents, such as ethylene dichloride, chloroform and nuclear chlorinated hydrocarbons such as monochlorobenzene, dichlorobenzene or mixtures thereof.

The sheet forming solution may contain dyes, pigments, plasticizers or other effect or modifying agents.

In accordance with my invention, I prepare the sheet forming solution by dissolving the polystyrene in a solvent medium containing from 75 to 99 parts of the aromatic hydrocarbon and from 25 to 1% of the non-solvent alcohol, the ratio of polystyrene to solvent medium being from 1:10 to 1:4.

The solution of polystyrene in the solvent medium is then cast upon a suitable casting surface, the solvent removed by subjecting the sheet material, while on the casting surface, preferably to elevated temperatures, and then stripping the sheet material from the casting surface.

In order further to illustrate my invention, the following examples are given, it being understood, however, that the examples are not to be construed as limiting the scope of the invention.

Example I

A solution is prepared by dissolving 20 parts by weight of polystyrene in 80 parts by weight of a solvent medium containing 97% by volume of xylene and 3% by volume of octyl alcohol (2-ethyl hexanol). This solution is cast on a metal plate and on a glass plate and the solvent caused to evaporate. Uniform, clear films of polystyrene are obtained, which films easily strip from the plates without tearing or "crazing."

Example II

A solution is prepared by dissolving 20 parts by weight of polystyrene in 80 parts by weight of a solvent medium containing 95% by volume of xylene and 5% by volume of glycerine. This solution is cast on a metal plate and on a glass plate and the solvent caused to evaporate. Uniform, clear films of polystyrene are obtained, which films easily strip from the plates without tearing or "crazing."

Example III

A solution is prepared by dissolving 20 parts by weight of polystyrene in 80 parts by weight of a solvent medium containing 90% by volume of xylene and 10% by volume of benzyl alcohol. This solution is cast on a metal plate and on a glass plate and the solvent caused to evaporate. Uniform films of polystyrene are obtained, which films easily strip from the plates without tearing or "crazing."

In all the above examples the films cast on the plates were 0.001" in thickness and were seasoned for two hours at 140° C., although the drying or removal of solvent may be carried out at room temperature.

It is to be understood that the foregoing detailed description is merely given by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

Having described my invention, what I desire to secure by Letters Patent is:

1. Solution for use in preparing polystyrene material, comprising polystyrene dissolved in a solvent medium consisting essentially of a substance, selected from the group consisting of aromatic hydrocarbons, chlorinated aliphatic and aromatic hydrocarbons, and mixtures thereof, as solvent for the polystyrene, and from 1 to 5%, based on the volume of the solvent, of an alcohol which is a non-solvent for the polystyrene, said alcohol being selected from the group consisting of liquid aliphatic monohydric alcohols containing at least 5 carbon atoms, liquid polyhydric alcohols and liquid aromatic alcohols.

2. Solution for use in preparing polystyrene material, comprising polystyrene dissolved in a

solvent medium consisting essentially of a substance, selected from the group consisting of aromatic hydrocarbons, chlorinated aliphatic and aromatic hydrocarbons, and mixtures thereof, as solvent for the polystyrene and from 1 to 5%, based on the volume of the solvent, of hexanol.

3. Solution for use in preparing polystyrene material, comprising polystyrene dissolved in a solvent medium consisting essentially of an aromatic hydrocarbon, as solvent for the polystyrene, and from 1 to 5%, based on the volume of the solvent, of octyl alcohol.

4. Solution for use in preparing polystyrene material, comprising polystyrene dissolved in a solvent medium consisting essentially of an aromatic hydrocarbon, as solvent for the polystyrene, and from 1 to 5%, based on the volume of the solvent, of glycerine.

5. Solution for use in preparing polystyrene material, comprising polystyrene dissolved in a solvent medium consisting essentially of xylene, as solvent for the polystyrene, and from 1 to 5%, based on the volume of the solvent, of octyl alcohol.

6. Solution for use in preparing polystyrene material, comprising polystyrene dissolved in a solvent medium consisting essentially of xylene, as solvent for the polystyrene, and from 1 to 5%, based on the volume of the solvent, of glycerine.

7. Solution for use in preparing polystyrene material, comprising polystyrene dissolved in a solvent medium consisting of 97% by volume of xylene and 3% by volume of octyl alcohol.

8. Solution for use in preparing polystyrene material, comprising polystyrene dissolved in a solvent medium consisting of 95% by volume of xylene and 5% by volume of glycerine.

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