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PROCESS FOR MAKING A MAT COMPOSED OF ALUMINUM SILICATE FIBERS AND POLYTETRAFLUOROETHYLENE

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This invention relates to the preparation of reinforced gasket stock composed of polytetrafluoroethylene and mineral fibrous material.

It has been known heretofore that fibrous polytetrafluoroethylene can be used as a packing or gasket material. This advantages of polytetrafluoroethylene in such applications include excellent corrosion resistance and resistance to harmful effects of high temperatures.

An object of this invention is to provide gasket stock which contains polytetrafluoroethylene in combination with a mineral fibrous material. Another object is to provide a novel process for manufacturing gasket stock. Other objects of the invention will appear hereinafter.

The aforesaid objects are accomplished in accordance with this invention, by coagulating an aqueous dispersion of polytetrafluoroethylene, preferably in colloidal form, in the presence of the mineral fibrous material, by addition of a coagulating agent such as aluminum sulfate.

The preferred mineral fibrous material to be used in the process of this invention is "Fiberfrax," a fibrous form of aluminum silicate which is believed to be produced by blowing a falling stream of the molten material as it is formed from an electric furnace. It is composed chiefly of equal parts of silica and alumina, has a melting point of about 3000° F. and a fiber diameter of one to eight microns. The fiber length is up to 3 inches but is mostly under 0.5 inch. The material is manufactured by the Carborundum Company, Niagara Falls, New York.

The polytetrafluoroethylene dispersions which are employed are preferably concentrated to at least about 10% solids, prior to introduction into the dilute slurry of mineral fiber. The quantity of dispersing agent is highly critical, because if this quantity exceeds a maximum permissible amount, the polytetrafluoroethylene will not exhaust upon the mineral fibers. The critical amount of dispersing agent, based on the weight of the polytetrafluoroethylene, is about 2% of "Triton" X-100 (an alkyl aryl polyether alcohol non-ionic surface active agent, more specifically a polyethylene glycol-p-octyl-phenol ether made by Rohm and Haas Company), or a quantity of other dispersing agent having the same dispersing or wetting power. If the quantity of dispersing agent is too large, the desired products are not obtained.

The coagulating agent can be any highly ionizable material, preferably a substance which yields ions of a polyvalent metal, such as aluminum. Ordinary alum (sodium potassium aluminum sulfate), or $Al_2(SO_4)_3$, in common hydrated forms, or other similar salts are highly effective. The quantity which is required is not highly critical.

The process of the invention is preferably carried out in ordinary paper-making equipment, although other types or apparatus for disintegrating fibrous masses and admixing additives with fibrous material can also be

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used. After the ingredients are mixed together, the resulting fibrous mass is removed, sheeted, and compressed, suitably by means of a press capable of delivering at least about 1000 lbs. per sq. inch of pressure to the gasket stock. The resulting sheet can be dried and sintered at elevated temperatures, suitably up to 400° C.

The invention is illustrated further by means of the following example:

Example.—A 0.7% (by weight) suspension of "Fiberfrax" fibers in water is prepared by beating the "Fiberfrax" fibers sufficiently gently in water to avoid any appreciable or notable shortening of the fiber length. This requires about five minutes. To the resulting suspension is added a quantity of colloidal dispersion of polytetrafluoroethylene (17% by weight) corresponding to 60 parts of polytetrafluoroethylene per 40 parts of the mineral fiber. A 1% solution of aluminum sulfate in water (about 5% of the total volume) is next added, and the gentle agitation is continued. The pH of the mixture at this stage is about 5. A mat of the resulting fibers is next produced upon a wire screen, using the conventional paper-making technique. Drying the resulting mat is accomplished first by applying a blotting paper, and next by means of a drum drier operating at 250° F. Finally the mat is compressed and sintered at 400° C. The cooling of the mat is performed under sufficient pressure (1000 pounds per square inch) to keep the mat dense. The resulting product is a highly effective gasket material.

The quantity of dispersing agent, "Triton" X-100, hereinabove defined, in the dispersion employed in the foregoing example was 1%, based on the weight of polytetrafluoroethylene. Repetition of the experiment with 5% of this agent failed to produce exhaustion of the polytetrafluoroethylene.

I claim:

1. A process which comprises adding a highly ionizable coagulating agent to a dispersion of colloidal polytetrafluoroethylene in water containing fibrous aluminum silicate, said dispersion being further characterized in that it is obtained by adding concentrated aqueous colloidal polytetrafluoroethylene, having a polytetrafluoroethylene content of 10 to 17% by weight to a fibrous aluminum silicate aqueous dispersion having a fibrous aluminum silicate content of about 0.7% by weight, said dispersion containing a controlled quantity of dispersing agent sufficient to prevent coagulation of the dispersion except upon addition of said highly ionizable material, the weight ratio of polytetrafluoroethylene: fibrous aluminum silicate being about 60:40, agitating the resulting mixture until the said polytetrafluoroethylene becomes exhausted upon the said fibrous aluminum silicate, at a pH of about 5, thereafter forming a mat of the resulting fibers, drying and sintering the said mat, said controlled quantity of dispersing agent being not in excess of 2% by weight, based on the weight of said dispersion, said dispersing agent being an alkyl aryl polyether alcohol.

2. Process of claim 1 wherein the said coagulating agent is aluminum sulfate.

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