

METHOD FOR RECLAIMING FUSED VINYL PLASTISOLSField of the Invention

The present invention pertains generally to the field
5 of recycling polymeric materials. More particularly, the
invention is a method for reclaiming fused vinyl plastisols,
such as polyvinyl chloride that is used as a backing
material for carpets.

10 Background of the Invention

Vinyl plastisols are solid or foamed plastics that
typically comprise, for example, polyvinyl chloride,
phthalate plasticizers, inert fillers and miscellaneous
pigments and processing aids. One of the most common uses
15 of such materials is as a backing material for residential
and commercial carpet products.

One concern associated with such products is the
problem of recycling them when their useful product life has
ended. This is particularly true for carpet products, given
20 the huge amounts of carpet that are disposed of each year,
and the large amounts of vinyl plastisols that are
incorporated into such products. In addition, large amounts

of backing material are collected as scraps during the carpet manufacturing process.

Heretofore, the primary method for recycling the backing component of carpets has been to grind the vinyl
5 plastisol backing material into small pieces, which are thermoformed into plastic parts. Cryogenic grinding has also been used, in which the vinyl plastisol is first chopped into relatively small pieces, then frozen, then ground into a powdery form while frozen. This powder can
10 then be blended in with new plastisol to form new backing layer. However, such approaches tend to be very labor intensive, as a result of the mechanical grinding operations. Cryogenic methods also have the added disadvantage of the required energy costs associated with
15 freezing the material. Accordingly, it would be useful to have a method for recycling such materials that does not depend on purely mechanical operations such as grinding or chopping. The present invention provides such a method.

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Summary of the Invention

In a basic aspect, the present invention is a method for recycling fused vinyl plastisols using chemical, rather

than purely mechanical means. The invention allows such materials to be returned to their original liquid state, allowing them to be re-used to form new products by casting them as a film or mold and fusing the materials back into a solid or foamed vinyl part in any of a variety of known manners. In the case of vinyl plastisol backings for carpets, the discarded or scrap materials can be returned to their original liquid state and re-used to form new carpet backing.

10 The method generally comprises the steps of 1) comminuting the fused vinyl plastisol, preferably by grinding or chopping the material, to form particles of reduced size; 2) adding to the particles one or more solvents selected from the group consisting of
15 cyclohexanone, dichloromethane, hexane, chloroform, methyl ethyl ketone and ethyl acetate, to solvate the particles; 3) adding additional plasticizer that is compatible with the original plasticizers used in the vinyl; and 4) removing the solvent from the mixture, preferably by drawing the solvent
20 off under vacuum.

Detailed Description of Preferred Embodiment

In a preferred embodiment, the vinyl plastisol to be reclaimed is ground or cut to approximately .25 inches in diameter pieces for ease of handling and to speed the
5 reclamation process by increasing surface area of the material. Any of a variety of commercial machines can be used for this purpose, with such methods being well known to persons of ordinary skill in the art.

This ground vinyl is then added to a bath of solvent.
10 The solvent may include one or a combination of the following: cyclohexanone, dichloromethane, hexane, chloroform, methyl ethyl ketone, ethyl acetate. Heat and/or agitation may be applied to the solvent/plastisol mixture to speed the solvation process.

15 After complete solvation of the vinyl, additional plasticizer that is compatible with the original plasticizers used in the vinyl are added to the mixture. These may include: phthalate esters, adipates, azelates, trimellitates, benzoates, and polymeric plasticizers.

20 Under a vacuum, the solvent is drawn off and the remaining mixture is strained to remove any unwanted

components. The solvent is preferably reclaimed for reuse in the process, using known techniques.

The remaining mixture is a highly plasticized material. In the case of a polyvinyl chloride material, a dispersion
5 grade polyvinyl chloride is added to the reclaimed material to achieve a castable vinyl plastisol. In this form it can then be used in a standard plastisol application.

A particularly preferred embodiment of the process is described below, using flexible PVC carpet backing material
10 as the material to be reclaimed. In the first step, flexible PVC is ground or chopped to coarse particle size. The size of the particles will determine the length of the solvating step.

The chopped vinyl scrap is blended with solvent, such
15 as dichloromethane, with approximately one part vinyl added to four parts solvent. This solvent/scrap mixture is aged for a period of about 24 hours and agitated intermittently to increase the speed of solvation. Persons of skill in the art will recognize that the period of solvation may vary,
20 depending on the nature of the plastisol and solvent, the temperature, and other factors.

Once all the vinyl has been solvated, approximately 6 parts of DINP (diisononylphthalate) is added as a plasticizer. This mixture of solvent, vinyl, and DINP is transferred to a rotary vacuum dryer. Using a closed
5 system, the solvent is removed from the mixture and captured in a separate container.

The remaining slurry is a plastisol that is highly plasticized. Resin, filler, and stabilizers can be added to this mixture in the rotary vacuum dryer, or in a rotary
10 mixer. The resulting product can be used to make new backing material (or other products) in a normal manner.

While in the foregoing there have been described
various preferred embodiments of the present invention, it should be understood that the invention is not limited to
15 those embodiments and that various modifications may be made to those embodiments without departing from the scope and spirit of the invention as claimed below.

What is claimed is:

1. A method for reclaiming a fused vinyl plastisol material comprising the steps of a) comminuting the
5 plastisol material to form particles of reduced size; b) adding to the particles a solvent selected from the group consisting of cyclohexanone, dichloromethane, hexane, chloroform, methyl ethyl ketone and ethyl acetate, to form a mixture of solvent and particles; c) dissolving the
10 particles in the mixture; d) adding a plasticizer to the mixture; and e) removing the solvent from the mixture.
2. The method of claim 1 wherein the solvent is removed from the mixture by pulling a vacuum on the mixture.
- 15 3. The method of claim 1 wherein the vinyl plastisol is polyvinyl chloride.

