CLAIMS

1. A polyurethane foam, characterized in that it is capable of being obtained by reaction:

a) of a polyisocyanate and

b) of a polyester polyol obtained by polymerization of a mixture of polyol monomers and diacid monomers, said diacid monomers being composed of at least one mixture M of diacids exhibiting a following composition by weight:

| | |
|---|---|
| methylglutaric acid (MGA): | 50-99% |
| ethylsuccinic acid (ESA): | 0-30% |
| adipic acid (AA): | 0-50%. |

2. The foam as claimed in claim 1, characterized in that the mixture M of diacids exhibits the composition by weight:

| | |
|---|---|
| methylglutaric acid (MGA): | 75-95% |
| ethylsuccinic acid (ESA): | 0-12% |
| adipic acid (AA): | 0-20%. |

3. The foam as claimed in claim 2, characterized in that the mixture M of diacids exhibits the composition by weight:

| | |
|---|---|
| methylglutaric acid (MGA): | 80-95% |
| ethylsuccinic acid (ESA): | 0-10% |
| adipic acid (AA): | 5-15%. |

4. The foam as claimed in one of claims 1 to 3, characterized in that the diacids of the mixture M are partially or completely in the anhydride form.

5. The foam as claimed in one of claims 1 to 4, characterized in that the polyol monomers are chosen from the group consisting of diols and polyether diols.

6. The foam as claimed in any one of the preceding claims, characterized in that the mixture M of diacids is obtained from a mixture N comprising 2-methyl-

glutaronitrile (MGN), ethylsuccinonitrile (ESN) and adiponitrile (AdN) by reaction with a basic hydroxyl compound in solution in a solvent at a temperature of between 80 and 200°C, removal of the ammonia formed and reaction of the salt obtained with an inorganic acid.

7. The foam as claimed in any one of claims 1 to 5, characterized in that the mixture M of diacids is prepared by:
a) hydrating a mixture N comprising 2-methylglutaronitrile (MGN), ethylsuccinonitrile (ESN) and adiponitrile (AdN) to give amide functional groups, and
b) hydrolyzing the amide functional groups to give carboxyl functional groups.

8. The foam as claimed in claim 7, characterized in that the hydration stage is carried out by reaction with water in the presence of a strong inorganic acid, by using from 1 to 1.5 mol of water per mole of nitrile functional group to be hydrated in the presence of a strong inorganic acid, at a temperature which makes it possible to maintain the reaction medium in the liquid state.

9. The foam as claimed in claim 7 or 8, characterized in that the hydrolysis stage is carried out, with stirring, by using from 1 to 10 mol of water per mole of amide functional group to be hydrolyzed and an amount of strong inorganic acid, expressed in protons, corresponding to at least 1 mol of proton per mole of amide to be hydrolyzed, the temperature of the reaction medium being determined in order to maintain the reaction medium in the liquid state.

10. The foam as claimed in one of claims 7 to 9, characterized in that the dicarboxylic acids formed are recovered by maintaining the reaction medium, without stirring, at a temperature greater than the melting point of the diacids and/or the salts formed in order

to make possible the separation by settling of the reaction medium, the upper phase comprising the diacids being separated.

11. The foam as claimed in one of claims 6 to 10, characterized in that the mixture N of dinitrile compounds is a mixture resulting from the process for the manufacture of adiponitrile by double hydrocyanation of butadiene.

12. The foam as claimed in any one of the preceding claims, characterized in that the diol is chosen from the group consisting of ethylene glycol, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, 1,10-decanediol, 2,2-dimethyl-1,3-propanediol, 1,3-propanediol, trimethylpropanol and bisphenol.

13. The foam as claimed in one of the preceding claims, characterized in that the polyether diol is chosen from the group consisting of diethylene glycol, dipropylene glycol and 1,1,3-trimethyltriethylenediol.

14. The foam as claimed in one of the preceding claims, characterized in that the polyurethane foam comprises a dispersed particulate inorganic filler.

15. The foam as claimed in claim 14, characterized in that the dispersed particulate inorganic filler exhibits particles with a size of less than 60 μm.

16. The foam as claimed in claim 15, characterized in that the dispersed particulate inorganic filler exhibits particles with a size of less than 20 μm.

17. The foam as claimed in any one of claims 14 to 16, characterized in that the dispersed particulate inorganic filler is chosen from powders formed of aluminosilicate, of silica, in particular obtained by

precipitation, of titanium oxide, of talc, of kaolin and of calcium carbonate.

## CLAIMS

1. A polyurethane foam which comprises the reaction product of:

a) a polyisocyanate with

b) a polyester polyol obtained by polymerization of a mixture of polyol monomers and diacid monomers, said diacid monomers comprising at least one mixture M of diacids having the following composition by weight:

- methylglutaric acid (MGA): 80-95%

- ethylsuccinic acid (ESA): 0-10%

- adipic acid (AA): 5-15%.

2. The polyurethane foam as defined by claim 1, wherein the diacids of the at least one mixture M are partially or completely in the anhydride form.

3. The polyurethane foam as defined by claim 1, wherein the polyol monomers are selected from the group consisting of diols and polyether diols.

4. The polyurethane foam as defined by claim 1, wherein the at least one mixture M of diacids is obtained from a mixture N comprising 2-methylglutaronitrile (MGN), ethylsuccinonitrile (ESN) and adiponitrile (AdN) by reaction with a basic hydroxyl compound in solution in a solvent at a temperature ranging from 80 to 200 °C, removal of the ammonia thus formed and reacting the salt obtained with an inorganic acid.

5. The polyurethane foam as defined by claim 1, wherein the at least one mixture M of diacids is prepared in a reaction medium by:

a) hydrating a mixture N comprising 2-methylglutaronitrile (MGN), ethylsuccinonitrile (ESN) and adiponitrile (AdN) to provide amide functional groups, and

b) hydrolyzing the amide functional groups to provide dicarboxylic acids.

6. The polyurethane foam as defined by claim 5, wherein said hydrating is carried out by reaction with water in the presence of a strong inorganic acid, employing from 1 to 1.5 mol of

water per mole of nitrile functional group to be hydrated in the presence of a strong inorganic acid, at a temperature which maintains the reaction medium in the liquid state.

7. The polyurethane foam as defined by claim 5, wherein said hydrolyzing is carried out, under stirring, employing from 1 to 10 mol of water per mole of amide functional group to be hydrolyzed and an amount of strong inorganic acid, expressed in protons, corresponding to at least 1 mol of proton per mole of amide to be hydrolyzed, the temperature of the reaction medium being such as to maintain the reaction medium in the liquid state.

8. The polyurethane foam as defined by claim 5, wherein the dicarboxylic acids formed are recovered by maintaining the reaction medium, without stirring, at a temperature greater than the melting point of the diacids and/or salts formed to permit the separation by settling of the reaction medium, the upper phase comprising the diacids being separated.

9. The polyurethane foam as defined by claim 4, wherein the mixture N of dinitrile compounds comprises a mixture resulting from the production of adiponitrile by double hydrocyanation of butadiene.

10. The polyurethane foam as defined by claim 1, wherein said polyol monomers are selected from the group consisting of ethylene glycol, 1,4-butanediol, 1,5-pentanediol, 1,6-hexanediol, 1,10-decanediol, 2,2-dimethyl-1,3-propanediol, 1,3-propanediol, trimethylpropanol and bisphenol.

11. The polyurethane foam as defined by claim 1, wherein said polyol monomers are selected from the group consisting of diethylene glycol, dipropylene glycol and 1,1,3-trimethyltriethylenediol.

12. The polyurethane foam as defined by claim 1, comprising a dispersed particulate inorganic filler.

13. The polyurethane foam as defined by claim 12, said dispersed particulate inorganic filler comprising particles having a size of less than 60 μm.

14. The polyurethane foam as defined by claim 13, said dispersed particulate inorganic filler

comprising particles having a size of less than 20 μm.

15. The polyurethane foam as defined by claim 14, said dispersed particulate inorganic filler comprising particles having a size of less than 10 μm.

16. The polyurethane foam as defined by claim 12, said dispersed particulate inorganic filler comprising powders formed of aluminosilicate, of silica, of titanium oxide, of talc, of kaolin or of calcium carbonate.

17. A molded shaped article comprising the polyurethane foam as defined by claim 1.

18. A shoe sole comprising the polyurethane foam as defined by claim 1.