HOFFMANN EITLE

HOFFMANN EITLE
Patent- und Rechtsanwälte
Partnerschaftsgesellschaft mbB

Arabellastraße 30
81925 München
Deutschland | Germany

T +49. (0)89. 92 409. 0
F +49. (0)89. 91 83 56

pm@hoffmanneitle.com
www.hoffmanneitle.com

HOFFMANN EITLE | Postfach 81 04 20 | 81904 München
WIPO
World Intellectual
Property Organization
34, chemin des Colombettes

**1211 Genève 20**
Schweiz

Dr. Daniel Grohs
dgrohs@hoffmanneitle.com

Munich, April 30, 2020

**Our Ref.: 219 071 u5/mba**
**International Application PCT/EP2019/083442**
**Trinseo Europe GmbH**

**Amendments of the claims under Article 19 PCT**

Applicant is in receipt of the written opinion of the International Searching Authority and herewith files **amendments** under Art. 19 PCT. In the enclosed claims set, claim 7 is amended to refer back to claim 1 (support being available in paragraph 55 as well as in previous claims 1 and 7); claim 11 is amended to recite a limited number of metal salts; and claim 13 has been adapted to recite a decomposition residue that is contained in the foam as supported by paragraph 61 in illustrative embodiment 37 as well as in claims 6 and 10.



DR. DANIEL GROHS
European Patent Attorney
Hoffmann Eitle
Association No. 151

***Encl***. Amended claims

## Amended claims

What is claimed is:

1. A foaming composition comprising:
(a) a plurality of chains of a copolymer of one or more vinylidene aromatic monomers and one or more unsaturated acids, the copolymer having about 0.01 to about 15.0 percent by weight of the one or more unsaturated acids wherein the acid groups are pendant from the copolymer;
(b) a metal salt, metal oxide or combination thereof, the metal having a valence of at least 2; and,
(c) one or more blowing agents.

2. The foaming composition of Claim 1 wherein the foaming composition is an admixture of each of (a), (b) and (c).

3. The foaming composition of Claim 1, wherein the foaming composition are separate parts that are brought into contact when forming a foam.

4. The foaming composition according to any one of the preceding claims wherein the metal is one or more of transition metals, post transition metals, metalloids or an alkaline earth metals.

5. The foaming composition according to any one of the preceding claims wherein the metal is one or more of zinc, zirconium, aluminum, magnesium and calcium.

6. The foaming composition according to any one of the preceding claims wherein the metal salt is a salt that decomposes into one or more gases at a temperature used to form a foam.

7. A method of forming a foam comprising:
a) heating ~~a~~ the foaming composition of claim 1 ~~comprised of a reversibly cross-linkable copolymer having a vinylidene aromatic monomer wherein the reversibly cross-linkable copolymer undergoes un-crosslinking and crosslinking during the method in the presence of a blowing agent~~ and

b) extruding the foaming composition from a higher pressure to a lower pressure to form an extruded foam comprised of the reversibly cross-linkable copolymer that is crosslinked.

8. The method of Claim 7, wherein the reversibly crosslinkable copolymer that is crosslinked is comprised of copolymer of one or more vinylidene aromatic monomers and one or more unsaturated acids, the copolymer having about 0.01 to about 15.0 percent by weight of the one or more unsaturated acids wherein the acid groups are pendant from the copolymer and a metal salt, metal oxide or combination thereof, the metal having a valence of at least 2, wherein the copolymer is crosslinked through ionic bonds between the unsaturated acids and the metal of the metal salt or metal oxide.

9. The method of either Claim 7 or 8, wherein the solution viscosity, measured at 23 °C at 10 weight percent in toluene, of the reversibly cross-linkable copolymer that is crosslinked is at least 100 percent greater than the solution viscosity of the uncrosslinked copolymer.

10. The method of either Claim 8 or 9, wherein the metal salt decomposes to form a gas during the method.

11. The method of any one of Claims 8 to 10, wherein the metal salt is a metal carbonate, ~~metal stearate, metal acetate, metal bicarbonate, metal hydroxide,~~ metal carboxylate, metal acetylacetonate or combination thereof.

12. The method of any one of Claims 8 to 11, wherein the metal salt or metal oxide has a metal that is one or more of zinc, zirconium, aluminum, magnesium and calcium.

13. A foam comprised of a copolymer comprising one or more vinylidene aromatic monomers and one or more unsaturated acids, the copolymer having about 0.01 to about 15.0 percent by weight of the one or more unsaturated acids wherein the acid groups are pendant from the copolymer and a metal salt, metal oxide or combination thereof, the metal having a valence of at least 2, wherein the copolymer is crosslinked through ionic bonds between the unsaturated acids and the metal of the metal salt or metal oxide and the foam contains decomposition residue of the metal salt.

14. The foam of Claim 13, wherein the metal of the metal salt or metal oxide is zinc, zirconium, aluminum, magnesium, calcium or combination thereof.

15. The foam of either Claim 13 or 14, wherein the solution viscosity, measured at 23 °C at 10 weight percent in toluene, of the crosslinked copolymer is at least 100 percent greater than the solution viscosity of the uncrosslinked copolymer.