The applicant has conducted considerable research into ways to modify the zinc monoglycerolate in order to improve the efficiency of crystallization, through increasing the crystallization temperature and/or speeding up the time period to complete crystallization of the polymer.

The applicant achieved this result following many years of effort, during which a range of attempts were made to reduce the crystallite size of zinc monoglycerolate

The applicant has now successfully achieved small crystal size of the zinc monoglycerolate through the use of a modifier and through the control of production conditions of the zinc monoglycerolate. The key innovation, as compared to prior art, is the ability to use the readily commercially available and relatively inexpensive “indirect or French process” zinc oxide (e.g. as obtainable from Umicore Zinc Chemicals) as the starting point, as opposed to hydrozincite (as described in US 7,074,949). For a description of the “indirect or French process” for zinc oxide production, see Moezzi, A., McDonagh, A. M., & Cortie, M. B. (2012) Zinc oxide particles: Synthesis, properties and applications. *Chemical Engineering Journal*, *185*, 1-22. The modifier does not alter the fundamental chemical structure of zinc monoglycerolate.

According to another aspect, there is provided a process for the preparation of zinc monoglycerolate, comprising reacting a zinc compound, which is different from hydrozincite (i.e. it is a zinc compound other than hydrozincite, and is not derived from hydrozincite), with glycerol and a modifier, in the presence of an acid catalyst, wherein:
- the zinc compound is selected from the group consisting of zinc oxide, zinc carbonate, zinc hydroxide, zinc carboxylate and combinations thereof, or/and
- the reaction is conducted in the presence of less than 10% by weight water, based on the total weight of the reaction composition.

In preferred embodiments, both conditions are used in the process.

The present application also describes preferred temperature conditions for the production of zinc monoglycerolate from zinc oxide and glycerol, in the presence of an acid catalyst and a modifier, to control the crystallite and agglomerate size of the product.

By producing zinc monoglycerolate in the specified modified form described above, the applicant has been able to produce polymer compositions containing the zinc monoglycerolate (nu

CLAIMS:

1. A zinc monoglycerolate in the form of agglomerates of crystallites, wherein the crystallite size based on the average coherence domain length is less than 30nm in the <100> direction (size along the <100> zone axis), and less than 60nm in the <011> direction (size along the <100> zone axis), as determined by the Scherrer equation via powder X-ray diffraction; and the aspect ratio computed by <100>/<011> coherent domain lengths is less than 0.65, preferably less than 0.56.

2. The zinc monoglycerolate according to claim 1 containing a modifier.

3. The zinc monoglycerolate according to claim 2, wherein the modifier is a glycerol carboxylate ester.

4. The zinc monoglycerolate according to claim 3, wherein the glycerol carboxylate ester is a saturated fatty acid ester of glycerol.

5. The zinc monoglycerolate according to claim 4, wherein the glycerol carboxylate ester is glycerol monostearate.

6. The zinc monoglycerolate according to any one of claims 2 to 5, wherein the amount of modifier is between 1.0 and 5.0 mol% with respect to the zinc monoglycerolate.

7. A process for the preparation of the zinc monoglycerolate according to claim 1, comprising reacting a zinc compound, which is different from hydrozincite, and is not derived from hydrozincite, with glycerol and a modifier in the presence of an acid catalyst, wherein:
- the zinc compound is selected from the group consisting of zinc oxide, zinc carbonate, zinc hydroxide, zinc carboxylate and combinations thereof, or/and
- the reaction is conducted in the presence of less than 10% by weight water, based on the total weight of the reaction composition.

8. The process according to claim 7, wherein the modifier is a glycerol carboxylate ester.

9. The process according to claim 7 or claim 8, wherein the amount of the glycerol is between 90 and 110 mol% with respect to the zinc compound.

10. The process according to any one of claims 7 to 9, wherein the amount of the modifier is between 1.0 and 5.0 mol% with respect to the zinc compound.

11. The process according to any one of claims 7 to 10, wherein the amount of the acid catalyst is between 0.2 and 5 mol% with respect to the zinc compound.

12. A composition comprising an organic polymer and the zinc monoglycerolate according to any one of claims 1 to 6.

13. A composition according to claim 12, wherein the organic polymer is selected from the group consisting of polyolefins, polyvinyl chloride, polystyrene, polyacrylamide, polyester, polyamide, and copolymers thereof, and copolymers of one or more of acrylonitrile, butadiene and styrene with each other or with another co-monomers.

14. The composition according to claim 12 or claim 13, wherein the zinc monoglycerolate is present in an amount of 0.001% to 20%, preferably 0.005% to 5%, relative to the weight of the organic polymer.

15. A composition according to claim 12, wherein the organic polymer is a polyolefin and the zinc monoglycerolate at a given loading level in the polyolefin provides a higher crystallisation temperature of the polyolefin than achieved with the same loading level of a zinc monoglycerolate having a crystallite size of greater than 30 nm in the <100> direction or of greater than 60nm in the <011> direction or having an aspect ratio computed by <100>/<011> coherent domain lengths that is greater than 0.65.

16. A composition according to claim 12, wherein the organic material is an isotactic polypropylene and the zinc monoglycerolate at a given loading level in the isotactic polypropylene provides a time to achieve 50% polymer crystallisation ($t_{1/2}$) at 140°C that is at least 40% less than that achieved with the same loading level of a zinc monoglycerolate having a crystallite size greater than at least one of 30 nm in the <100> direction or of greater than 60 nm in the <011> direction, or having an aspect ratio computed by <100>/<011> coherent domain lengths that is greater than 0.65.

17. A use of the zinc monoglycerolate according to any one of claims 1 to 6 to increase the crystallisation temperature or the mechanical properties, preferably the E-modulus or yield strength, of an organic polymer.

18. A use of the zinc monoglycerolate according to any one of claims 1 to 6 as nucleating agent in an organic polymer.