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(54) Title: POLYESTER RESIN WITH INORGANIC TONER AND A PROCESS FOR ITS PREPARATION

(57) Abstract: The present disclosure relates to a polyester composition comprising polyethylene terephthalate, at least one inorganic toner selected from the group consisting of ultramarine blue and iron oxide in an amount in the range of about 1 ppm to about 50 ppm with respect to the total mass of the composition, and at least one phosphate compound in the range of 5 ppm to 300 ppm based on the total weight of polyester composition. The present disclosure also relates to a process for the preparation of a polyester resin composition.



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POLYESTER RESIN WITH INORGANIC TONER AND A PROCESS FOR ITS PREPARATION

This application is a Patent of Addition to the Indian Patent Application No. 3248/MUM/2011 filed on 18th November 2011, the entire contents of which are specifically incorporated herein by reference.

FIELD OF THE DISCLOSURE:

This disclosure relates to a polyester composition comprising inorganic toners and a process for preparation thereof. The present disclosure also relates to a toner composition.

BACKGROUND:

Several organic toners that are used in the manufacture of polymers and especially PET are known but they are associated with drawbacks, which include lower thermal stability at polyester polymerization temperature and coarser particle size, which may cause agglomeration and thus lead to problems of frequent polymer filter choking in continuous polyester plant.

Inorganic compounds such as ultramarine blue and iron oxide with zinc oxide have been used as coloring agents/colorants in amounts in excess of 100 ppm to 50,000 ppm in the manufacture of flame retardant polymers, textiles etc. For example, US20110086225 suggests a flame retardant polyester composition comprising zinc oxide and/or ultramarine blue as a coloring agent in the range of 100-50,000 ppm.

US20040266920 suggests a colored synthetic fiber produced by melt blending fiber-forming polyamide(s), thermoplastic polyester(s), and colorants comprising organic and/or inorganic pigments. The colorants can be zinc oxide and/or ultramarine blue in the range of 0.1 to 8 wt%

US20030129398 suggests an article, e.g. cloth formed by melt blending of colorants with water-insoluble alkylene aryl polyester sulfonate salt copolymer, and forming colorant polyester sulfonate mixture; combining the colorant polyester sulfonate mixture with a polyamide or polyester resin in the melt; and forming the melt into an article. The colorants can be zinc oxide and/or ultramarine blue in the range of 0.1 to 8 wt%.

Therefore, there is required a composition for the manufacture of preforms, containers, especially bottles, films, thermoformed sheets and containers, and fibers, wherein the composition employs inorganic pigments as color toners, thereby reducing the drawbacks associated with organic toners.

Our co-pending patent application number **3248/MUM/2011** discloses a polyester composition comprising polyethylene terephthalate, at least one inorganic toner selected from the group consisting of ultramarine blue and iron oxide in an amount in the range of about 1 to about 50 ppm calculated with respect to the total mass of the composition, and a zinc compound.

DEFINITION:

As used in the present specification, the following words and phrases are generally intended to have the meanings as set forth below, except to the extent that the context in which they are used indicate otherwise.

The term “toner” in the context of the specification means an agent that is incorporated in the resin in minute quantities (1 ppm to 50 ppm) only for the sake of correcting the yellowness of the resin caused on account of the degradation at higher polymerization temperature

The term “colorant” means an agent incorporated in the resin in larger quantities (100 ppm to 50,000 ppm) with or without pigments and dyes for the sake of imparting a color to the resin.

The components L^* , a^* & b^* denote the color values measured on an L, a, b scale, where:

'L' denotes Black to White. When L value is '0', it indicates Black & '100' indicates White.

'a' denotes Red to Green. When 'a' value is '+ve', it indicates Red & '-ve' indicates Green.

'b' denotes Yellow to Blue. When 'b' value is '+ve', it indicates Yellow & '-ve' indicates Blue.

The term "Haze" is a measure of the scattering of light through the sample; the higher the number the more the haze.

OBJECTS:

Some of the objects of the present disclosure, which at least one embodiment herein satisfies, are as follows:

It is an object of the present disclosure to provide a polyester composition comprising inorganic toners for the manufacture of preforms bottles, containers, films, thermoformed sheets and containers, fibers and filament yarns.

It is yet another object of the present disclosure to provide a process for the preparation of a polyester composition for the manufacture of fibers, filament yarns, preforms, bottles, containers, films, thermoformed sheets and containers that comprises inorganic toners.

It is still further object of the present disclosure to provide an inorganic toner composition.

SUMMARY:

In one aspect of the present disclosure there is provided a polyester composition comprising Polyethylene terephthalate, at least one inorganic toner selected from the group consisting of ultramarine blue and iron oxide, in an amount in the range of 1

ppm to 50 ppm with respect to the total mass of the composition, and at least one phosphate compound.

The phosphate compound can be selected from the group consisting of zinc phosphate ($\text{Zn}_3(\text{PO}_4)_2$) and tricalcium phosphate $\text{Ca}_3(\text{PO}_4)_2$.

The polyester composition of the present disclosure further comprises at least one co-monomer selected from the group consisting of isophthalic acid, neopentyl glycol, Methyl Propane Diol, cyclohexane dimethanol, naphthalene dicarboxylic acid, adipic acid.

The amount of phosphate compound can be in the range of 5 ppm to 300 ppm with respect to the total mass of the polyester composition.

In another aspect of the present disclosure there is provided a preform made from the composition as claimed in claim 1, characterized by L^* value in the range of 65 to 75, b^* value in the range of 2.0 to 5.0 and percentage haze in the range of 2.0 to 7.0.

In still further aspect of the present disclosure there is provide an article made from the composition of the present disclosure, said article being selected from the group consisting of bottles, container, film, fiber, filament yarn, thermoformed sheet and thermoformed container.

In yet another aspect of the present disclosure there is provided a process for the preparation of the polyester composition as claimed in claim 1, said process comprising the following steps:

- a. esterifying terephthalic acid or ester thereof with ethylene glycol to obtain a pre-polymer and subjecting the pre-polymer containing reaction mixture to polymerization in the presence of an antimony based

polymerization catalyst to obtain polyethylene terephthalate polymer;
and

- b. incorporating at least one inorganic toner, selected from the group consisting of ultramarine blue and iron oxide in an amount ranging between 1 to 50 ppm with respect to the total mass of the polyester composition along with at least one phosphate compound selected from the group consisting of zinc phosphate ($\text{Zn}_3(\text{PO}_4)_2$) and tricalcium phosphate $\text{Ca}_3(\text{PO}_4)_2$, either before, during or after the esterification.

The phosphate compound can be added at any stage before polymerization.

The phosphate compound can be incorporated as a premix or slurry in monoethylene glycol at any stage before polymerization.

Typically, the inorganic toner and phosphate compound are incorporated as a premix in the reaction mixture at any stage before polymerization.

The amount of phosphate compound can be in the range 5 ppm to 300 ppm with respect to the mass of the polyester composition.

In yet another aspect there is provided an inorganic toner composition for polyesters; said composition comprises at least one inorganic compound selected from the group consisting of ultramarine blue and iron oxide, at least one phosphate compound and optionally a vehicle.

The amount of inorganic compound can be in the range of 1 ppm to 50 ppm with respect to the total mass of the inorganic toner composition and the amount of phosphate compound can be in the range 5 ppm to 300 ppm with respect to the total mass of the inorganic toner composition.

The vehicle in the inorganic toner composition can be ethylene glycol.

DETAILED DESCRIPTION:

In one aspect, the present disclosure provides a polyester resin composition of Polyethylene terephthalate (PET) meant for the manufacture of preforms, containers, bottles, polyester films, fibres, filament yarn and thermoformed sheets and containers, that comprises inorganic toners and at least one phosphate compound.

The polyester resin composition comprises Polyethylene terephthalate (PET), at least one inorganic toner and at least one phosphate compound. The amount of phosphate compound in the composition is in the range of 5 ppm to 300 ppm with respect to the total mass of the polyester composition.

The inorganic toners present in the polyester resin composition of the present disclosure, include ultramarine blue and/or iron oxide. These inorganic toners are thermally more stable than the organic toners. Moreover, the particle size of these toners is in the range of 0.5-5 microns (D50 value) (compared to 20-30 micron size for organic toners) which results in better dispersion in polyester matrix.

The proportion of the inorganic toner present in the resin composition of the present disclosure is typically in the range of 1 ppm to 50 ppm.

The phosphate compound can be at least one selected from the group consisting of zinc phosphate ($\text{Zn}_3(\text{PO}_4)_2$), sodium dihydrogen phosphate (NaH_2PO_4), disodium hydrogen phosphate (Na_2HPO_4), trisodium phosphate (Na_3PO_4), sodium aluminium phosphate ($\text{Na}_8\text{Al}_2(\text{OH})_2(\text{PO}_4)_4$), monopotassium phosphate (KH_2PO_4), dipotassium phosphate (K_2HPO_4), tripotassium phosphate, monocalcium phosphate $\text{Ca}(\text{H}_2\text{PO}_4)_2$, dicalcium phosphate (CaHPO_4), tricalcium phosphate $\text{Ca}_3(\text{PO}_4)_2$, hydroxyapatite ($\text{Ca}_5(\text{PO}_4)_3(\text{OH})$), apatite ($\text{Ca}_{10}(\text{PO}_4)_6(\text{OH}, \text{F}, \text{Cl}, \text{Br})_2$), octacalcium phosphate, monomagnesium phosphate ($\text{Mg}(\text{H}_2\text{PO}_4)_2$), dimagnesium phosphate (MgHPO_4), magnesium phosphate tribasic ($\text{Mg}_3(\text{PO}_4)_2$), manganese(II) phosphate $\text{Mn}_3(\text{PO}_4)_2$, manganese dihydrogen phosphate (MnH_2PO_4), vanadium phosphate (VPO_4),

vanadium(II) hydrogen phosphate (VHPO_4), chromium phosphate (CrPO_4), chromium(III) hydrogen phosphate ($\text{Cr}_2(\text{HPO}_4)_3$), iron(III) phosphate (FePO_4), iron(III) bis(hydrogenphosphate) ($\text{H}_3\text{FeO}_8\text{P}_2$), cobalt(II) phosphate ($\text{Co}_3(\text{PO}_4)_2$), cobalt(III) hydrogen phosphate ($\text{Co}_2(\text{HPO}_4)_3$), nickel phosphate ($\text{Ni}_3\text{O}_8\text{P}_2$), copper phosphate ($\text{Cu}_3(\text{PO}_4)_2$), nickel phosphate ($\text{Ni}_3\text{O}_8\text{P}_2$), nickel(III) hydrogen phosphate ($\text{Ni}_2(\text{HPO}_4)_3$), beryllium phosphate ($\text{Be}_3\text{O}_8\text{P}_2$) and beryllium hydrogen phosphate (BeHO_4P).

The desired results were obtained when phosphate compounds such as zinc phosphate ($\text{Zn}_3(\text{PO}_4)_2$) and/or tricalcium phosphate $\text{Ca}_3(\text{PO}_4)_2$ were used and therefore, these phosphate compounds are preferred.

Optionally, the resin composition of the present disclosure also comprises at least one co-monomer selected from the group consisting of isophthalic acid, neopentyl glycol, methyl propane diol, cyclohexane dimethanol, naphthalene dicarboxylic acid and adipic acid.

In another aspect of the present disclosure there is provided a preform made from the resin composition of the present disclosure characterized by L^* value in the range of about 65 to 75, b^* value in the range of 2.0 to 5.0 and percentage haze in the range of 2.0 to about 7.0 %.

In still another aspect, the present disclosure also provides an article such as bottles, container, film, fiber, filament yarn, thermoformed sheets and thermoformed containers made from the polyester composition of the present disclosure.

In yet another aspect of the present disclosure there is provided a process for the preparation of the polyester resin composition for the manufacture of preforms, bottles, films, fibers, filament yarn, thermoformed sheets and thermoformed containers.

Terephthalic acid or ester thereof is esterified with ethylene glycol to obtain a pre-polymer. The pre-polymer containing reaction mixture is then subjected to polymerization reaction in the presence of an antimony based polymerization catalyst to obtain polyethylene terephthalate polymer.

At least one inorganic toner, selected from the group consisting of ultramarine blue and iron oxide in an amount in the range of about 1 ppm to about 50 ppm with respect to the total mass of the polyester composition, along with at least one phosphate compound is incorporated, either before, during or after the esterification. The phosphate compound is at least one selected from the group consisting of zinc phosphate ($\text{Zn}_3(\text{PO}_4)_2$), sodium dihydrogen phosphate (NaH_2PO_4), disodium hydrogen phosphate (Na_2HPO_4), trisodium phosphate (Na_3PO_4), sodium aluminium phosphate ($\text{Na}_8\text{Al}_2(\text{OH})_2(\text{PO}_4)_4$), monopotassium phosphate (KH_2PO_4), dipotassium phosphate (K_2HPO_4), tripotassium phosphate, monocalcium phosphate $\text{Ca}(\text{H}_2\text{PO}_4)_2$, dicalcium phosphate (CaHPO_4), tricalcium phosphate $\text{Ca}_3(\text{PO}_4)_2$, hydroxyapatite ($\text{Ca}_5(\text{PO}_4)_3(\text{OH})$), apatite ($\text{Ca}_{10}(\text{PO}_4)_6(\text{OH}, \text{F}, \text{Cl}, \text{Br})_2$), octacalcium phosphate, monomagnesium phosphate ($\text{Mg}(\text{H}_2\text{PO}_4)_2$), dimagnesium phosphate (MgHPO_4), magnesium phosphate tribasic ($\text{Mg}_3(\text{PO}_4)_2$), manganese(II) phosphate $\text{Mn}_3(\text{PO}_4)_2$, manganese dihydrogen phosphate (MnH_2PO_4), vanadium phosphate (VPO_4), vanadium(II) hydrogen phosphate (VHPO_4), chromium phosphate (CrPO_4), chromium(III) hydrogen phosphate ($\text{Cr}_2(\text{HPO}_4)_3$), iron(III) phosphate (FePO_4), iron(iii) bis(hydrogenphosphate) ($\text{H}_3\text{FeO}_8\text{P}_2$), cobalt(II) phosphate ($\text{Co}_3(\text{PO}_4)_2$), cobalt(III) hydrogen phosphate ($\text{Co}_2(\text{HPO}_4)_3$), nickel phosphate ($\text{Ni}_3\text{O}_8\text{P}_2$), copper phosphate ($\text{Cu}_3(\text{PO}_4)_2$), nickel phosphate ($\text{Ni}_3\text{O}_8\text{P}_2$), nickel(III) hydrogen phosphate ($\text{Ni}_2(\text{HPO}_4)_3$), beryllium phosphate ($\text{Be}_3\text{O}_8\text{P}_2$) and beryllium hydrogen phosphate (BeHO_4P), preferably zinc phosphate ($\text{Zn}_3(\text{PO}_4)_2$) and/or tricalcium phosphate $\text{Ca}_3(\text{PO}_4)_2$.

In accordance with one of the embodiments of the process of the present disclosure the phosphate compound is incorporated at any stage before polymerization.

In accordance with one embodiment of the present disclosure, the phosphate compound is incorporated as a premix or slurry in monoethylene glycol at any stage before polymerization.

In accordance with one embodiment of the present disclosure, the inorganic toner and phosphate compound are incorporated as a premix in the reaction mixture at any stage before polymerization.

It is found that free phosphorous compound during the polymerization reaction adversely affects the process as the free phosphorous compound reacts with antimony based poly-condensation catalyst leading to the formation antimony phosphate which in turn leads to consumption of antimony catalyst hampering the reaction rate. Furthermore, the antimony phosphate formed gets deposited on polymer filters causing choking and intermittent gray coloration and haze in preform.

Our co-pending patent application number **3248/MUM/2011** discloses polyethylene terephthalate and a process for its preparation. In the process for the preparation of polyethylene terephthalate, inorganic toner, zinc compound and free phosphorous compounds are used. The incorporation of the zinc and phosphorous compound before the addition of antimony avoids the interaction of the phosphorous compound with antimony. The inventors of the present disclosure focused on the aforesaid problem and after conducting experiments found that phosphate compounds can be used as thermal stabilizers instead of using a combination of zinc oxide and free phosphorous compound. This in-turn obviates the incorporation of a free phosphorous compound such as orthophosphoric acid (OPA), phosphoric acid, triethylphosphonoacetate (TEPA) in the reaction mixture. Also, the use of phosphate compound eliminates the problems associated with the presence of free phosphorous compound, which includes drop in reaction rate, frequent choking of polymer filters and adverse impact on gloss of preforms and articles, as free phosphorous compound is not available to react with antimony based poly-condensation catalyst.

The amount of phosphate compound used in the process ranges between 5 ppm and 300 ppm with respect to the total mass of the polyester composition.

In a further aspect, the present disclosure also provides an inorganic toner composition for polyesters, comprising at least one inorganic compound selected from the group consisting of ultramarine blue and iron oxide; at least one phosphate compound and optionally a vehicle.

The amount of inorganic compound in the inorganic toner composition is in the range of 1 ppm to 50 ppm with respect to the total mass of the inorganic toner composition whereas the amount of phosphate compound in the inorganic toner composition is in the range of 5 ppm to 300 ppm with respect to the total mass of the inorganic toner composition.

The vehicle used in the inorganic toner composition of the present disclosure is ethylene glycol.

One of the advantages of the process of the present disclosure is that it provides a higher degree freedom to choose toners with or without cobalt, without countering any of the adverse effects associated with the absence of cobalt.

If cobalt is also used as a toner, the process of the present disclosure still obviates the method step of preparing a premix of the toner (i.e cobalt) with phosphoric acid and adding the same during polymerization.

The details of the disclosure will be further explained by the way of examples which do not limit the scope of the disclosure. The individual components in the formulations as given in the examples are maintained in ppm and percentage by weight unless otherwise specified.

Example-1:

Table-1 exemplifies the data with recipes comprising a combination of zinc phosphate and inorganic toners. It was observed that the reaction rate in the melt section was better as compared to the control recipe. It was also observed that the addition of zinc phosphate did not affect the brightness as such, however, it markedly reduced the yellowness value of the pre-form by 58 % (The b^* values came down to 3.7, from 8.9). Furthermore, the addition of zinc phosphate also caused a significant reduction of about 13.0 % in Haze (%) (the percent Haze was reduced from 7.0 % to 6.1 %). Thus, the pre-form obtained by using zinc phosphate along with the inorganic pigments exhibited better optical properties such as better brightness and better bluish hue and better clarity.

Table-1: Data for trials with zinc phosphate along with Inorganic toners

	C	E1	E2
Recipe	Control with Free Phosphoric acid (25 ppm as P)	Zinc Phosphate (10 ppm as P)	Zinc Phosphate (15 ppm as P)
Stannous Oxalate (ppm)	70	70	70
Sb (ppm)	290	200	175
Co (ppm)	10	NIL	NIL
Inorganic Blue Toner (ppm)	NIL	25	25
Inorganic Red Toner (ppm)	NIL	10	10
Melt Polymerization Data			
EI(Min)	199	192	195
PC Time(Min)	108	92	91
IV	0.608	0.619	0.611
L*	69.3	69.1	68.8
a*	0.17	-0.80	-0.51
b*	0.16	-0.17	-1.45
COOH	26	24	24
SSP Polymerization Data			
IV rise/Hr	0.0251	0.0255	0.0267
IV	0.830	0.823	0.825
L*	87.1	86.0	86.0
a*	-0.52	-1.43	-1.41
b*	0.82	-0.50	-1.28

AA(ppm)	0.49	0.47	0.45
Preform Properties			
Process Temp(°C)	280-295	280-295	280-295
L*	68.9	68.5	70.4
a*	0.9	-1.0	-1.3
b*	8.9	4.6	3.7
% Haze	7.0	6.8	6.1
Preform AA (ppm)	6.0	5.4	5.6
IV Drop (DI/g)	0.051	0.049	0.045

Example-2:

Table-2 exemplifies the data with recipes comprising a combination of tricalcium phosphate and inorganic toners. It was observed that the addition of tricalcium phosphate did not affect the brightness as such, however, it markedly reduced the yellowness value of the pre-form by 13 % (The b* values came down to 7.7 from 8.9). Thus, the pre-form obtained by using a tricalcium phosphate along with the inorganic toners exhibited similar optical properties such as brightness, clarity and better bluish hue.

Table-2: Data for trials with tricalcium phosphate along with Inorganic toners

	C	E3
Recipe	Control with Free Phosphoric acid (25 ppm as P)	Tricalcium phosphate (10 ppm as P)
Stannous Oxalate (ppm)	70	70
Sb (ppm)	290	290
Co (ppm)	10	NIL
Inorganic Blue Toner (ppm)	NIL	20
Inorganic Red Toner (ppm)	NIL	10
Melt Polymerization Data		
EI(Min)	199	194
PC Time(Min)	108	95
IV	0.608	0.595

L*	69.3	70.0
a*	0.17	-1.32
b*	0.16	-0.39
COOH	26	29
SSP Polymerization Data		
IV rise/Hr	0.0251	0.0257
IV	0.83	0.852
L*	87.1	86.8
a*	-0.52	-0.95
b*	0.82	-0.65
AA(ppm)	0.49	0.36
Preform Properties		
Process Temp(°C)	280-295	280-295
L*	68.9	70.27
a*	0.9	-0.11
b*	8.9	7.7
% Haze	7	7.8
Preform AA (ppm)	6	6
IV Drop (Dl/g)	0.051	0.053

TECHNICAL ADVANCEMENT AND ECONOMIC SIGNIFICANCE:

- Avoidance of drop in reaction rate, frequent choking of polymer filters and adverse impact on gloss of preforms, bottles, polyester films, fiber, filament yarn, thermoformed sheets by incorporation of the thermal stabilizer phosphate compound at any stage during the polymerization process.
- Thermal stability of the toners resulting in better color and appearance of the resin.
- Lower particle size of the toner leads to better dispersion in the polymer matrix which reduces the chances of haze in the final product.
- Use of thermally stable inorganic toner further reduces deterioration of resin color significantly even after recycling of this resin almost for 3 times, as compared to conventional cobalt containing resin

Throughout this specification the word “comprise”, or variations such as “comprises” or “comprising”, will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

The use of the expression “at least” or “at least one” suggests the use of one or more elements or ingredients or quantities, as the use may be in the embodiment of the disclosure to achieve one or more of the desired objects or results.

Any discussion of documents, acts, materials, devices, articles or the like that has been included in this specification is solely for the purpose of providing a context for the disclosure. It is not to be taken as an admission that any or all of these matters form a part of the prior art base or were common general knowledge in the field relevant to the disclosure as it existed anywhere before the priority date of this application.

The numerical values mentioned for the various physical parameters, dimensions or quantities are only approximations and it is envisaged that the values higher/lower than the numerical values assigned to the parameters, dimensions or quantities fall within the scope of the disclosure, unless there is a statement in the specification specific to the contrary.

While considerable emphasis has been placed herein on the specific features of the preferred embodiment, it will be appreciated that many additional features can be added and that many changes can be made in the preferred embodiment without departing from the principles of the disclosure. These and other changes in the preferred embodiment of the disclosure will be apparent to those skilled in the art from the disclosure herein, whereby it is to be distinctly understood that the foregoing descriptive matter is to be interpreted merely as illustrative of the disclosure and not as a limitation.

Claims

1. A polyester composition comprising Polyethylene terephthalate, at least one inorganic toner selected from the group consisting of ultramarine blue and iron oxide in an amount in the range of 1 ppm to 50 ppm with respect to the total mass of the composition, and at least one phosphate compound.
2. The polyester composition as claimed in claim 1, wherein the phosphate compound is selected from the group consisting of zinc phosphate ($\text{Zn}_3(\text{PO}_4)_2$) and tricalcium phosphate $\text{Ca}_3(\text{PO}_4)_2$.
3. The polyester composition as claimed in claim 1, further comprising at least one co-monomer selected from the group consisting of isophthalic acid, neopentyl glycol, Methyl Propane Diol, cyclohexane dimethanol, naphthalene dicarboxylic acid, adipic acid.
4. The polyester composition as claimed in claim 1, wherein the amount of the phosphate compound is in the range of 5 ppm to 300 ppm with respect to the total mass of the polyester composition.
5. A preform made from the composition as claimed in claim 1, characterized by L^* value in the range of 65 to 75, b^* value in the range of 2.0 to 5.0 and percentage haze in the range of 2.0 to 7.0.
6. An article made from the composition as claimed in claim 1, wherein said article is selected from the group consisting of bottles, container, film, fiber, filament yarn, thermoformed sheet and thermoformed container.
7. A process for the preparation of the polyester composition as claimed in claim 1, said process comprising the following steps :

- a. esterifying terephthalic acid or ester thereof with ethylene glycol to obtain a pre-polymer and subjecting the pre-polymer containing reaction mixture to polymerization in the presence of an antimony based polymerization catalyst to obtain polyethylene terephthalate polymer; and
 - b. incorporating at least one inorganic toner, selected from the group consisting of ultramarine blue and iron oxide in an amount ranging between 1 to 50 ppm with respect to the total mass of the polyester composition along with at least one phosphate compound selected from the group consisting of zinc phosphate ($\text{Zn}_3(\text{PO}_4)_2$) and tricalcium phosphate $\text{Ca}_3(\text{PO}_4)_2$, either before, during or after the esterification.
8. The process as claimed in claim 7, wherein the phosphate compound is added at any stage before polymerization.
 9. The process as claimed in claim 7, wherein the phosphate compound is incorporated as a premix or slurry in monoethylene glycol at any stage before polymerization.
 10. The process as claimed in claim 7, wherein the inorganic toner and phosphate compound are incorporated as a premix in the reaction mixture at any stage before polymerization.
 11. The process as claimed in claim 7, wherein the amount of phosphate compound is in the range 5 ppm to 300 ppm with respect to the mass of the polyester composition.
 12. An inorganic toner composition for polyesters, said composition comprising at least one inorganic compound selected from the group consisting of

ultramarine blue and iron oxide, at least one phosphate compound and optionally a vehicle.

13. The inorganic toner composition for polyesters as claimed in claim 12, wherein the amount of inorganic compound is in the range of 1 ppm to 50 ppm with respect to the total mass of the inorganic toner composition and the amount of phosphate compound is in the range 5 ppm to 300 ppm with respect to the total mass of the inorganic toner composition.
14. The inorganic toner composition for polyesters as claimed in claim 12, wherein the vehicle is ethylene glycol.