Flame-retardant gray polyamide compositions and use thereof

Description

Field of the Invention

The present invention relates to flame-retardant polyamide compositions and to moldings produced therefrom.

Background

Combustible plastics generally have to be equipped with flame retardants in order to be able to attain the high flame retardancy demands made by the plastics processors and in some cases by the legislator. Preferably – for environmental reasons as well – nonhalogenated flame retardant systems that form only a low level of smoke gases, if any, are used.

Among these flame retardants, the salts of phosphinic acid (phosphinates) have been found to be particularly effective for thermoplastic polymers (DE 2 252 258 A and DE 2 447 727 A).

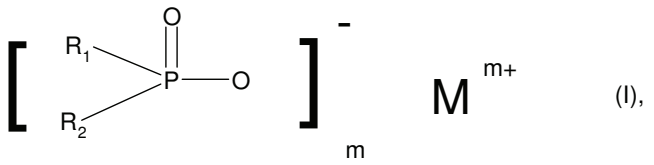
In addition, there are known synergistic combinations of phosphinates with particular nitrogen-containing compounds which have been found to be more effective as flame retardants in a whole series of polymers than the phosphinates alone (WO-2002/28953 A1, and also DE 197 34 437 A1 and DE 197 37 727 A1).

US 7,420,007 B2 discloses that dialkylphosphinates containing a small amount of selected telomers as flame retardant are suitable for polymers, the polymer being subject only to quite a minor degree of degradation on incorporation of the flame retardant into the polymer matrix.

Flame retardants frequently have to be added in high dosages in order to ensure sufficient flame retardancy of the polymer according to international standards. Due to their chemical reactivity, which is required for flame retardancy at high temperatures, flame retardants, particularly at higher dosages, can impair the processing stability of plastics. This may result in increased polymer degradation, crosslinking reactions, outgassing or discoloration.

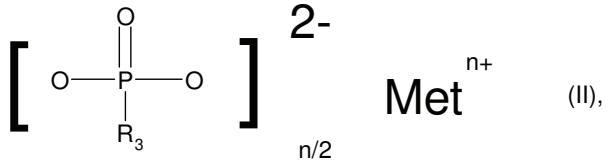
Summary of Invention

In one aspect, there is provided a flame-retardant polyamide composition comprising polyamide having a melting point of not more than 290°C as component A; fillers and/or reinforcers as component B; phosphinic salt of the formula (I) as component C:



(I),

in which R_1 and R_2 are ethyl, M is Al, Fe, TiO_p or Zn, m is 2 to 3, and p = (4 – m) / 2; compound selected from the group of the Al, Fe, TiO_p and Zn salts of ethylbutylphosphinic acid, of dibutylphosphinic acid, of ethylhexylphosphinic acid, of butylhexylphosphinic acid and/or of dihexylphosphinic acid as component D; phosphonic salt of the formula II as component E:



(II),

in which R_3 is ethyl, Met is Al, Fe, TiO_q or Zn, n is 2 to 3, and q = (4 – n) / 2; melamine polyphosphate having an average degree of condensation of 2 to 200 as component F, and gray colorant as component G.

In another aspect, there is provided a use of the polyamide compositions as described herein for production of fibers, films and shaped bodies, especially for applications in the electricals and electronics sector.

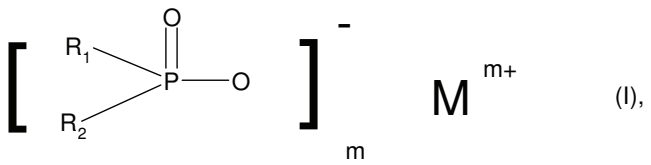
Detailed Description

The invention provides flame-retardant polyamide compositions comprising

- polyamide having a melting point of not more than 290°C, preferably of not more than 280°C and most preferably of not more than 250°C, as component A,

- fillers and/or reinforcers, preferably glass fibers, as component B,

- phosphinic salt of the formula (I) as component C

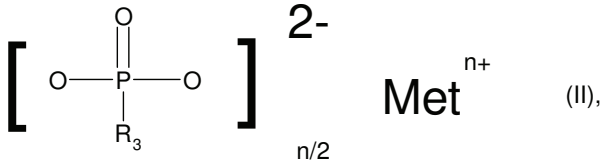


(I),

in which R_1 and R_2 are ethyl,
M is Al, Fe, TiO_p or Zn,
m is 2 to 3, preferably 2 or 3, and
p = (4 – m) / 2

- compound selected from the group of the Al, Fe, TiO_p and Zn salts of ethylbutylphosphinic acid, of dibutylphosphinic acid, of ethylhexylphosphinic acid, of butylhexylphosphinic acid and/or of dihexylphosphinic acid as component D

- phosphonic salt of the formula II as component E



(II),

in which R_3 is ethyl,

The moldings are preferably injection moldings or extrudates.

The flame-retardant polyamide compositions of the invention are suitable for production of fibers, films and shaped bodies, especially for applications in the electricals and electronics sector.

The invention preferably relates to the use of the flame-retardant polyamide compositions of the invention in or for plug connectors, current-bearing components in power distributors (residual current protection), printed circuit boards, potting compounds, power connectors, circuit breakers, lamp housings, LED housings, capacitor housings, coil elements and ventilators, grounding contacts, plugs, in/on printed circuit boards, housings for plugs, cables, flexible circuit boards, charging cables for mobile phones, motor covers or textile coatings.

The invention likewise preferably relates to the use of the flame-retardant polyamide compositions of the invention for production of shaped bodies in the form of components for the electrics/electronics sector, especially for parts of printed circuit boards, housings, films, wires, switches, distributors, relays, resistors, capacitors, coils, lamps, diodes, LEDs, transistors, connectors, regulators, memory elements and sensors, in the form of large-area components, especially of housing components for switchgear cabinets and in the form of components of complicated configuration with demanding geometry.

The wall thickness of the shaped bodies of the invention may typically be up to 10 mm. Particularly suitable shaped bodies are those having a wall thickness of less than 1.5 mm, more preferably a wall thickness of less than 1 mm and especially preferably a wall thickness of less than 0.5 mm.

Examples

The examples which follow elucidate the invention without restricting it.