Those sterically hindered phenolic antioxidants such as BHT or those used in the examples of WO 2015/095960 A1 may generate various thermal reaction or degradation products during extrusion and processing of polymers at high temperatures and radiolytic degradation products during sterilization with gamma-rays or electron beam irradiation.

Such organic degradation products from phenolic antioxidants migrating from polyethylene pipes into drinking water were identified by Arvin et al. (Brocca, D., Arvin, E, Mosbaek: Water Res., 36, 3675-3680, 2002) and are generally known as "Arvin substances" (see Fig. 2 in Arvin et al.).

Therefore, a need exists for stabilisers of polyisobutene which do not form such Arvin substances

For the sake of the present disclosure sterically hindered phenols are referred to as compounds with a phenolic moiety and at least one, preferably two sterically demanding groups in at least one ortho-position to the phenolic hydroxy group. Such sterically demanding groups are preferably radicals comprising at least one tertiary or quaternary carbon atom and/or radicals comprising at least 6 carbon atoms, more preferably selected from the group consisting of iso-propyl, tert-butyl, tert-amyl, cyclopentyl, and cyclohexyl.

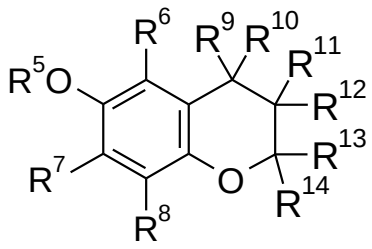
Since polyisobutene *inter alia* may be used in plasters or chewing gum the improved stabilisers must not be skin irritant, harmful or even toxic.

Multi component stabiliser compositions comprising *inter alia* phenols or chromanols are well known for stabilisation of polymers in general, see e.g. WO 2013/188490 A1, WO 2014/140383 A1 or WO 2016/81823 A1, however, no specific use in polyisobutene is disclosed in these documents.

This problem is solved by the use of at least one chromanols described in detail below in medium or high molecular polyisobutene for protection against degradation.

In an aspect, there is provided a process for processing polyisobutenes in at least one kneader or extruder at a temperature of at least 80 to 160 °C for not more than 2 hours and/or a specific shear energy of at least 0.08 kWh/kg, preferably at least 0.10, more preferably at least 0.15, even more preferably at least 0.15, and especially at least 0.20 kWh/kg polyisobutene, wherein the polyisobutene contains more than 100 to 5000 ppm by weight of at least one chromanol or the at least one chromanol is incorporated into the polyisobutene during the process, and wherein the average molecular weight (measured in the form of the Staudinger Index J_0)

decreases not more than 5%, wherein the at least one chromanol is of formula



(I)

wherein

R^5, R^6, R^7, R^8, R^9, R^{10}, R^{11}, R^{12}, R^{13} and R^{14} are each independently hydrogen, C_1-C_4-alkyl, C_1-C_4-alkyloxy or C_6-C_{12}-aryl and

R^5 is additionally C_1-C_4-alkylcarbonyl, C_1-C_4-alkyloxycarbonyl, C_6-C_{12}-arylcarbonyl or C_6-C_{12}-aryloxycarbonyl,

R^{13} and R^{14} additionally may be C_5-C_{30}-alkyl, C_5-C_{30}-alkenyl, C_5-C_{30}-alkadienyl or C_5-C_{30}-alkatrienyl, preferably C_6-C_{20}-alkyl or -alkatrienyl, more preferably C_{11}-C_{16}-alkyl or -alkatrienyl, especially C_{16}-alkyl or or C_{16}-alkatrienyl

and the radicals mentioned may each optionally be interrupted by one or more oxygen atoms and/or sulfur atoms and/or one or more substituted or unsubstituted imino groups, or be substituted by functional groups, aryl, alkyl, aryloxy, alkyloxy, halogen, heteroatoms and/or heterocycles,

and R^{13} is additionally chlorine.

In another aspect, there is provided a polyisobutene with a viscosity-average molecular weight Mv of 20 000 to 10 000 000 and a content of free, monomeric isobutene of less than 30 ppm by weight comprising more than 100 to 5000 ppm by weight of at least one chromanol as defined above.

In another aspect, there is provided the use of the polyisobutylenes as defined above in or as sealants, adhesives, coatings and roofings as well as white and black filled sheeting.

In another aspect, there is provided the use of the polyisobutylenes as defined above as or as an ingredient in chewing gums.

In another aspect, there is provided the use of the polyisobutylenes as defined above in plasters or adhesives for plasters.

In another aspect, there is provided a chewing gum, comprising polyisobutene with a content of free, monomeric isobutene of less than 30 ppm by weight comprising at least one chromanol comprising, preferably consisting of one or more of α-, β-, γ- or δ-tocopherols and/or one or more of α-, β-, γ- or δ-tocotrienol, preferably one or more of α- and γ-tocopherol, and especially synthetic or preferably natural vitamin E.

This problem is solved by a process for processing polyisobutenes in at least one kneader or extruder at a temperature of at least 80 to 160 °C for not more than 2 hours and/or a specific shear energy of at least 0.08 kWh/kg, preferably at least 0.10, more preferably at least 0.15, even more preferably at least 0.15, and especially at least 0.20 kWh/kg polyisobutene, wherein the polyisobutene contains more than 100 to 5000 ppm of at least one chromanol or the at least