## **Response to Referee #1:**

1. The mechanism of distortion of polymer chain that causes new absorption and emission bands are already explained in the article: It is because of the processing procedure. It is already has been described that degradation can be generated due to oxidative processes and/or heat during processing of the polymers, or then during use of the material due to environmental impact. Such degradation reactions are typically related to the protection of the polymer by the stabilizer. On the other hand, stabilizers can be degraded by reactions that are not related to their consumption during stabilization. All these will lead to radicals formation which will contribute in the new absorption and emission band. This issue has been discussed in detail in the following reference. Text in this context and a new reference has been added to section 3.1.

Buchberger W and Stiftinger M. Analysis of Polymer Additives and Impurities by Liquid Chromatography/Mass Spectrometry and Capillary Electrophoresis/Mass Spectrometry. Adv Polym Sci 2012;248: 39-68.

- 2. The chemical structure of both substances is to be found in some literature and even in some manuals. On the demand of the referee the structures of Tinuvin 770 and Tinuvin 123 are added as figure 1, other figures therefore have been renumbered. A reference has been added where the structures are shown in section 1. Sótonyi P, Kovács A, Volk G, Járay J, Benko A. Detection of Tinuvin 770, A Light Stabilizer of Plastic Materials from Dialysis Membranes, by High-Performance Liquid Chromatographic Analysis. Journal of Chromatographic Science 2004;42:49-53.
- 3. The absorption spectra of pure PC and PC with various Tinuvin 770 concentrations are shown in figure 3, there the absorbance is increase with increasing Tinuvin 770 content. It is the highest at 0.2%. It is remarkable therefore we intend to investigate this issue at low Tinuvin concentration from lowest possible up to 0.3%. Right now there is no clear explanation for that; it is a task for future work.
- 4. The question interfering with the referee's first question. Radicals formation is due to distortion of polymer chains chain during processing procedure (thermal) or/and formed by interaction of the additives with the host polymer. A text is added in context to this question.

## **Response to Referee #2:**

- 1. Tinuvin 770 white crystalline granules. Tinuvin 770 is recommended to be used in PP, EPDM, polystyrene, ABS, SAN, ASA and many other polymers. The recommended concentrations ranges are between 0.1 % and 0.5-1.0 %, depending on the substrate, processing conditions and application. Tinuvin 770 appearance is white crystalline granules. It is mixed in with large amount of commercial polycarbonate to insure the homogenous distribution of Tinuvin 770 then processed and the conditions describe in article. Tinuvin 123 is a colorless liquid; we used the same procedure for Tinuvin 123 sample preparation. A text in this context has been added to the article in section 2.1.
- Radiant exposure is irradiance integrated over time. Therefore: W/m2 x time(seconds)=J/m2, radiant exposure is normally measured in kJ/m2 and artificial weathering tests are timed in hours. All of these conversions can be combined to obtain the following: kJ/m2 = W/m2 x 3.6 x hours. The exposure dose then is 132192 kJ/m2. The exposure dose is checked and corrected in the text.

The temperature can be fixed automatically within the instrument. But for better estimation of sample temperature, the temperatures on the surface of a dummy sample have been measured using a small temperature sensor. The sample had surface temperatures around 60-65oC in different locations within the instrument. A text in this context has been added to the article in section 2.1.

- 3. It is certainly made but surprisingly no significant differences have been found. To confirm this founding some of non-irradiated and UV-irradiated samples have been tested by cathodoluminescence spectroscopy, the results were exactly the same as reported in the article. We saw no reason to repeat almost the same figure but this fact is already mentioned in the article in last paragraph in section 3.1.
- 4. The article aim was not to drive a formula describing any electronical transitions, the formula is only used as it is give in previous article by Tauc et al., 1966.
- 5. English language has been checked by English native speaker as the referee recommended.

## **Response to Referee #3:**

- 1. A commercial product Polycarbonate granule with a common brand names Lexan, Makrofol, Makrolon has been used. A text in this context has been added to the article in section 2.1
- 2. Leistritz twin screw extruder been used for processing, and temperatures at the die were 270+/-5 oC. A text in this context has been added to the article in section 2.1
- 3. I this stage it was not possible to give a possible structure of chromophores responsible for florescence emission.

The fluorescence emission of the degraded samples of PC should be due to the sample because of the additives and the processing; these were explained in already the article in section 3. The possibilities of external specific impurities are excluded.

The spectra of UV irradiated samples are also recorded, but surprisingly no significant differences have been found. To confirm this founding some of non-irradiated and UV-irradiated samples have been tested by cathodoluminescence spectroscopy, the results were exactly the same as mentioned in the article in section 3. We saw no reason to show almost the same figure once again but this fact is already mentioned in the article in the last paragraph in section 3.1, probably the referee has missed this text.

4. The recommended concentrations ranges of Tinuvin 770 and 123 for UV stabilization are between 0.1 % and 1.0 %, depending on the substrate, processing conditions and application. Both these products in these concentrations are not suitable to stabilize PC against UV light. Unfortunately lower concentrations were not possible to use because of some experimental limitation.