**Response to Reviewers**

**Editor:** It has been noticed that the Fig. 1 is modified from the reference: Tomic M, Bojovic B, Stamenkovic D, Mileusnic I, Koruga Đ. Lacunarity Properties of Nanophotonic Materials Based on Poly(Methyl Methacrylate) for Contact Lenses. Materials and technology 2017; 51(1):145-151. Please obtain the reprint permission from the publisher and state the original reference in the Figure legend.

**Answer:** In the image caption, the original reference for Fig1 is inserted. A permit was received (e-mail).

*Adapted from “Lacunarity Properties of Nanophotonic Materials Based on Poly(Methyl Methacrylate) for Contact Lenses” by Tomic M, Bojovic B, Stamenkovic D, Mileusnic I, Koruga Đ. 2017, Materials and technology*, *51(1)*, *p. 145-151. Copyright 2017 by Name of Copyright Holder. Reprinted with permission.*

**Reviewer 1**

**Comment 1:** Just as a suggestion, it could be interesting to add some information about clinical implications of CL surface roughness. Some comments about the relation between contact lens surface roughness and CL biocompatibility could be included, as well as the appropriate and corresponding references.

**Answer:** The following text is inserted in the introduction:

Every single SCL user provides a unique ambient condition in which these SCL surfaces have to function properly. SCL can lose functionality due to accumulated proteins, lipids and other tear components on outer SCL surface, despite routine cleaning activities. This is not valid in case of daily disposable SCL, but it’s extremely important for extended wear SCL. In this study the nanophotonic material comparison concerning the surface susceptibility for proteins and lipids deposits on tested SCLs was one of the tasks. The clinical performance of the SCL depends on roughness that is exposed to the deposit formation due to spoliation with tear residues and bacteria [46]. Thus, when characterizing a contact lens surface to complete the information on the finished quality, the surface roughness parameters and lacunarity have to be used to improve understanding of asperities and pits implications to the biocompatibility of the SCL nanophotonic materials [47]. Surface roughness, additionally, will affect changes on the surface of worn SCL [48] and have a large effect on the van der Waals attraction [49]. Therefore surface roughness parameters and lacunarity analysis provide the usability distinction of nanophotonic material for SCL that will operate in the pre-lens tear film, which is 2–5 μm in thickness [50].

**Comment 2:** It could be interesting to indicate main differences between SL38-A, SL38-B and SL38-C contact lens materials.

**Answer:** The following text is inserted in the manuscript:

Fullerenes mixed with other polymers are a group of optical filters with remarkable properties such as easy fabrication, predictable wavelength tuning and excellent performance stability. One of the main disadvantages of fullerenes is their low solubility in water. In order to make them soluble, fullerenes have to be functionalized with polar groups such as –OH and –COOH. Fullerene unlike its derivate, fullerol and methformin hydroxylate fullerene, does not dissolve in water and certain solvents.

Additional information for the reviewer (not inserted in the manuscript):

In order to determine the main differences between the nanophotonic contact lens materials, SL38-A, SL38-B and SL38-C, characterization of these materials was done in several studies [1-5].

1. Debeljković A, Matija L, Koruga Đ. Characterization of nanophotonic soft contact lenses based on poly (2-hydroxyethyl methacrylate) and fullerene. Hem Ind. 2013; 67:861-870.
2. Aleksandra Debeljkovic, Vladimir Veljic, Vera Sijacki-Zeravcic, Lidija Matija, Djuro Koruga, Characterization of materials for commercial and new nanophotonic soft contact lenses by Optomagnetic Spectroscopy, FME Transactions, (2014), vol. 42, no 1, 89-93.
3. Aleksandra D. Mitrović, Dragomir Stamenković, Manuel Conte, Spomenko Mihajlović, Study of the optical power of nanophotonic soft contact lenses based on poly (2- hydroxyethyl methacrylate) and fullerene, Contemporary Materials, (2014), vol. V−1, 151-160.
4. Aleksandra D. Mitrović, Vladimir M. Miljković, Dejana P. Popović, Djuro Lj. Koruga, Mechanical properties of nanophotonic soft contact lenses based on poly (2-hydrohzethil methacrylate) and fullerenes, Structural Integrity and Life, (2016) vol.16, no.1, 39–42, ISSN 1451-3749.
5. Dragomir Stamenković, Marija Tomić, Aleksandra Debeljković, Jelena Munćan, Lidija Matija, How incorporated nanomaterials in contact lenses affect their mechanical and optical properties: experimental study, Danubia-Adria Symposium on Advances in Experimental Mechanics, 26-28 September 2012, Belgrade, Serbia, p. 158-161, ISBN 978-86-7083-762-1.

**Comment 3:** Some paragraphs where results are discussed could also be
improved if same references are included. For example, no references are
included in paragraph from line 6 to the end of page 11.

**Answer:** The following references are inserted in paragraph from line 6 to the end of page 11: [30, 42].

**Reviewer 2**

**Comment 1:** Differences in the preparation methods and/or composition of the soft contact lenses SL38-A, SL38-B and SL38-C are not presented so that the obtained data on differences of the surface roughness cannot be connected to any parameter.

**Answer:** The following text is inserted in the manuscript:

Preparation method was the same for all three nanophotonic materials and therefore surface roughness hasn’t related to it. Although composition of particular nanomaterial into basic material has influence on surface roughness which is obtained after machining process, the relation is established among three nanophotonic materials vs. basic one per se. Further research activities will include different concentration of nanomaterials and consequently the influence to surface roughness.

**Comment 2:** “On the bases of these experiments, the assumption that incorporation of fullerene derivate can play a role in the prevention of a significant increase in roughness is confirmed.”

The results of this study do not support this conclusion. At which point it is assumed that surface roughness would be increased and at which point fullerene prevented this increase?

**Answer:** The following text is inserted in the manuscript:

“On the bases of these experiments, the assumption that incorporation of fullerene derivate will not increase surface roughness parameters is confirmed.”

**Comment 3:** 2.2.1 Soft contact lenses micro machining

This section should include description of differences in manufacture of SL38-A, SL38-B and SL38.

**Answer:** Inserted according to the suggestion of the reviewer:

Machining process was the same for all three nanophotonic materials and basic one. The recommended process parameters that exist for basic were chosen. These process parameters are already accompanied in machine control units which execute tool path during machining. Additionally, the contact lens manufacturers prefer to use in practice proven process parameters. ……existing text ……

In this paper, determination of the surface roughness relation to process parameters was not intention of this study. Although process parameters have influence on surface roughness, the relation is established among three nanophotonic vs. basic one per se. Further research activities will include optimization of process parameters strictly in accordance to contact lens manufacturers.

**Comment 4:** Please justify here and in the discussion why outer contact lens surface was analyzed and what is the importance of this analysis for the use of the particular contact lenses. Do these results correspond to the roughness of the inner contact lens surface properties in this particular fabrication method?

**Answer:** Inserted according to the suggestion of the reviewer:

Inner soft contact lens surface was made by molding process and shaped to fit onto cornea. Fitting parameters were lens diameter and back periphery curve. Inner soft contact lens was made as separate process that goes before outer surface machining. Fitting parameter for outer surface was front optic zone radius. Outer surface of soft contact lens was shaped to provide adequate optical power that was requested for vision correction. Inner surface roughness is not related to outer surface roughness.

**Comment 5:** “The values of roughness in this range are evidently negligible having no
direct mechanical influence on the comfort in contact lens wearing.” Thus, the significance of the study is not clear. Please explain.

**Answer:** The following text is inserted in the manuscript:

The convex surface of a SCL is in direct contact with the inner part of the upper eyelid. That contact would be painful if the convex surface was rough. The obtained values of roughness for new nanophotonic SCLs are in accordance with the results obtained in the literature [53, 54] without negative influence on the comfort in contact lens wearing.

**Comment 6:**
“The positive result of incorporating nanomaterials into basic material for 23 SCL is better quality of the nanophotonic SCLs surfaces.” This conclusion is not supported by the presented results since the basic SL38 also satisfied the standards. Please explain.

**Answer:** According to the suggestion of the reviewer, the sentence has been changed and better explained.

The positive result of incorporating nanomaterials into basic material for SCL is better quality of the nanophotonic SCLs surfaces due to lower values of roughness parameters for all nanophotonic materials compared to those for basic material.

**Comment 7:** Table 2: Please provide standard deviations of the measured parameters and
statistical differences among the investigated groups.

**Answer:** Table 2 is changed according to the suggestion of the reviewer.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Topography** | **1** | **2** | **3** | **Average value** | **Standard Deviation** |
| **SL 38** |
| ***Sa*** [nm] | 81.00 | 42.00 | 66.50 | 63.17 | 19.71 |
| ***Sq*** [nm] | 101.8 | 49.00 | 74.40 | 75.07 | 26.41 |
| ***Sz*** [nm] | 445.0 | 189.2 | 255.0 | 296.4 | 132.8 |
| **SL 38-A** |
| ***Sa*** [nm] | 152.9 | 89.60 | 94.60 | 112.4 | 35.19 |
| ***Sq*** [nm] | 173.5 | 107.2 | 120.0 | 133.6 | 35.17 |
| ***Sz*** [nm] | 567.4 | 425.8 | 435.8 | 476.3 | 79.02 |
| **SL 38-B** |
| ***Sa*** [nm] | 8.880 | 6.650 | 10.80 | 8.777 | 2.077 |
| ***Sq*** [nm] | 11.40 | 8.870 | 13.90 | 11.39 | 2.515 |
| ***Sz*** [nm] | 59.20 | 57.90 | 72.70 | 63.27 | 8.195 |
| **SL 38-C** |
| ***Sa*** [nm] | 27.50 | 18.80 | 21.30 | 22.53 | 4.479 |
| ***Sq*** [nm] | 31.80 | 23.20 | 24.90 | 26.63 | 4.554 |
| ***Sz*** [nm] | 134.2 | 98.70 | 92.30 | 108.4 | 22.57 |
| ***S*a represents a real arithmetic mean deviation; *S*q is the root-mean-square deviation of the surface; *S*z is height difference between the lowest and the highest point on topography image.** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

**Comment 8:** The last 2 sentences: “Contact lenses offer an attractive, effective option for non-invasive sight correction. Perhaps the success in contact lens materials innovations can best be measured by the degree to which soft contact lenses offer an optimal balance of these properties without compromising the comfort of the patient.”
This is rather a vague concluding remark. A sentence signifying surface roughness analysis of soft lenses should be probably more appropriate.

**Answer:** Inserted according to the suggestion of the reviewer:

The quality of a processed surface is determined by its roughness. Results confirmed that incorporation of fullerene’s derivate into PHEMA based SCL improved the surface roughness of new nanophotonic SCLs and that there is potential for biomedical application.