IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 6 Ver. 13 (June. 2018), PP 31-34
www.iosrjournals.org

Modified tissue Conditioner for Treating Abused Tissues– Morphological Characterizations

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Abstract: *Polymers are commonly utilized materials in dentistry in both provisional and long-term basis for various applications[1,2].In Prosthodontics impressions are commonly made using polymeric materials utilizing their elastic properties and dimensional stability. Among them, soft relining materials are important for treating abused tissues especially in Denture stomatitis[3,4].Polyethyl methacrylate is the most commonly utilized material in Prosthodontics as a tissue conditioner[5].Our study aimed to improve this polymer by incorporating nanoparticles into this and in this paper we are reporting about the morphological characterizations like Scanning electron microscopy (SEM) and Transmission electron microscopy (TEM) for assessing the incorporation and distribution of these nanoparticles in the matrix.*

Date of Submission: 12-06-2018 Date Of Acceptance: 27-06-2018

I. Introduction

Poly (ethyl methacrylate,PEMA) was formulated as a tissue conditioner and cross linking polymer to enhance strength of PMMA[6]. It has excellent chemical resistance, high surface resistance and ionic conductivity and can offer high optical transparency[7]. Powder- liquid formulation are available and is a self-curing polymer system. The liquid consists of ethyl methacrylate predominantly and the powder is mainly a polymer, benzoyl peroxide (which is considered as an initiator) and sufficient quantities of plasticizer (commonly butyl phthalate and butyl glycolate). PEMA is soft (with Tg of 65°C) at oral temperatures [8].

These soft polymeric system, made from highly plasticized acrylic undergo curing under normal pressure molding techniques and remain permanently soft until the plasticizer is lost through leaching after which the material becomes rigid [8]. But it has got a great disadvantage that it has got lower hardness and toughness values compared to PMMA[9]. In attempt to modify some of its disadvantages nanoparticle was incorporated.

II. Materials and Methods

Test samples were fabricated by mixing polymer powder and monomer in which nano particles are added.

2.1 Method of sample fabrication

Samples were prepared by adding nanoparticle into the monomer and well sonicated for proper dissolution in the monomer. Then into this solution polymer powder was added and stirred well and on reaching a manipulative stage, adapted into a mold space created by plaster of Paris and chemical curing was done under pressure[10] (Fig.1).

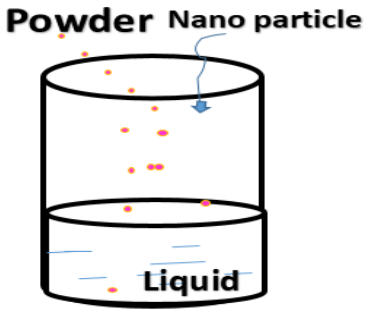

Fig.1 Schematic presentation of sample preparation

2.2 Characterizations

Morphology of each sample was analyzed using Scanning Electron Microscope(SEM)and Transmission Electron Microscope (TEM)**.**

2.2.1 Scanning Electron Microscopy (SEM)

Immediately after fabrication, samples were visualized under scanning electron microscope and analysis was done.

2.2.2 Transmission Electron Microscopy (TEM)

Before adding into the monomer,nanoparticles were evaluated with TEM and average particle size was assumed to be 40nm.For assessing particles width getting an idea about their morphology samples prepared were visualized under TEM and analyzed.

III. Results and discussion

3.1. Results

Microscopic methods were utilized for assessing

1) Morphology of polymer matrix.
2) Distribution of nanoparticles.
3) Morphology of nano reinforced PEMA.
4) Interactive zone (Interphase) of the nanoformulations.

SEM micrograph gave a comparative evaluation between two surfaces among which Fig 3b appeared rougher compared to 3b but macroscopically both appeared similar so in clinical application this roughness may not be a problem in its functional applications like treating abused tissues.

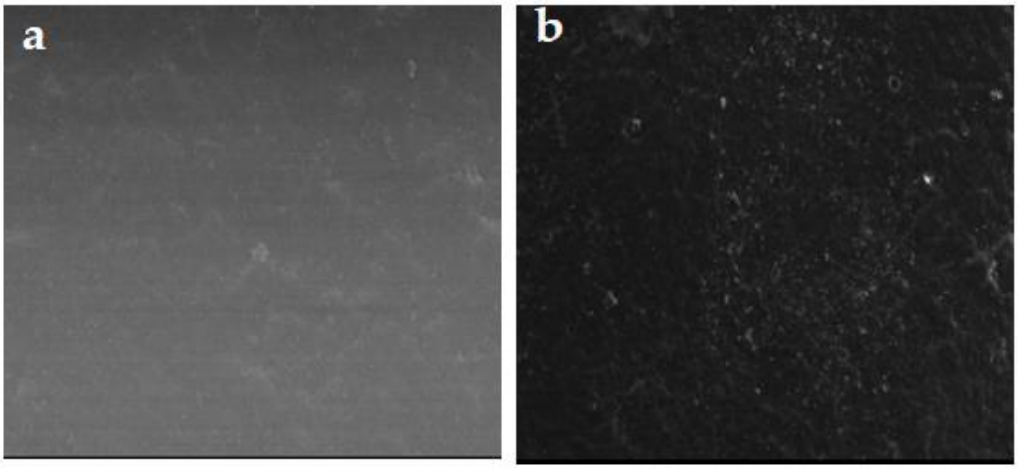

Fig 3.SEMicrograph of Polymer (a);Nano reinforced(b).

TEM analysis of nanoparticle revealed they are of average size 40nm and distribution curve showing % distribution of particles in each size is shown in Fig 2.

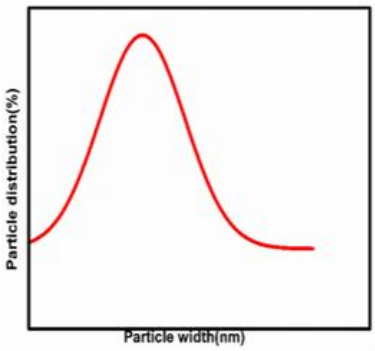

Fig.2 Particle distribution curve of nanoparticle.

TEM analysis revealed well distributed nanoparticles in the matrix without any defective sites.

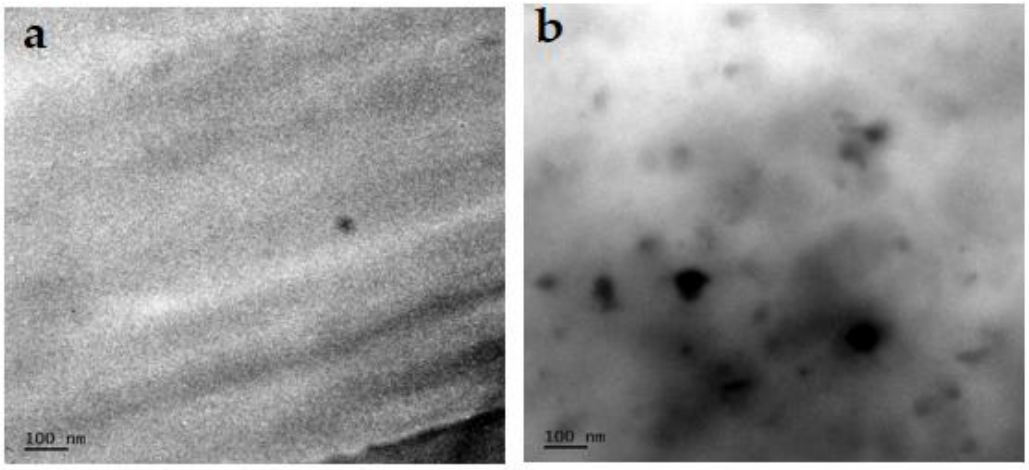

Fig 4. TEM images of Polymer (a);Nano reinforced(b).

3.2 Discussion

Polymer selected is PEMA which remains soft even after curing. The liquid is composed mainly of ethyl methacrylate and other chemicals and the powder is polymer and benzoyl peroxide. These materials are available in various tooth colors and can be used as a provisional restorative material.This material is highly indicated for usage as a tissue conditioner in abused tissues such as in Denture stomatitis and in patients with treated carcinomas (postsurgical phase or after irradiation).In this study we tried to incorporate nanoparticles into this polymeric matrix by physical mixing alone without any surface modifier or functionalization. Morphological studies and analyses based on them were planned for initial assessment of incorporation of nanoparticles in the polymer matrix. Aim of our study was to assess possibility of incorporation of nanoparticle into this polymer by physical method like sonication alone without any surface modification or functionalization[2].

IV. Conclusion

In our study we succeeded in nano reinforcement in PEMA and confirmed particle incorporation and their distribution by microscopic analyses.

References

[1]. Yunus M, Fauzan R. Mechanical properties of bioplastics cassava starch film with Zinc Oxide nanofiller as reinforcement. In: IOP Conference Series: Materials Science and Engineering. Vol 210. IOP Publishing; 2017:12015.
[2]. Raj I, Mozetic M, Prabhu J V, Jose J, Thomas S, Kalarikkal N. Fracture resistant, Antibiofilm adherent, self-assembled PMMA/ZnO nanoformulations for Biomedical applications: Physico-chemical and biological perspectives of nano reinforcement. Nanotechnology. 2018.
[3]. Wen J, Yeh C-K, Sun Y. Functionalized denture resins as drug delivery biomaterials to control fungal biofilms. ACS Biomater Sci Eng. 2016;2(2):224-230.
[4]. oralis in a constant depth film fermentor. J Appl Microbiol. 2001;91(1):47-53.
[5]. Kurtzman G. Crown and bridge temporization part 1: provisional materials. Insid Denistry. 2008;4:72-80.
[6]. Shah SR, Tatara AM, Lam J, et al. Polymer-based local antibiotic delivery for prevention of polymicrobial infection in contaminated mandibular implants. ACS Biomater Sci Eng. 2016;2(4):558-566.
[7]. Pradeepa P, Raj SE, Kalaiselvimary J, Sowmya G, Selvakumar K, Prabhu MR. Structural and electrochemical properties of PEMA with the influence of MWCNT/TiO2 filler. In: AIP Conference Proceedings. Vol 1731. AIP Publishing; 2016:110037.
[8]. Wilson HJ, Tomlin HR. Soft lining materials: some relevant properties and their determination. J Prosthet Dent. 1969;21(3):244-250.
[9]. Hernandez EP, Oshida Y, Platt JA, Andres CJ, Barco MT, Brown DT. Mechanical properties of four methylmethacrylate-based resins for provisional fixed restorations. Biomed Mater Eng. 2004;14(1):107-122.
[10]. Anusavice KJ, Shen C, Rawls HR. Phillips' Science of Dental Materials. Elsevier Health Sciences; 2013.

Dr.Indu Raj "Nano Modified tissue Conditioner for Treating Abused Tissues–Morphological Characterizations."IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 3, 2018, pp 31-34.