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Fracture Behaviour Of Dental Resins From Eclipse Resin System

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Introduction

Complete dentures are realized from different polymers and through various technologies. These materials are fragile and frequently appear cracks and fractures in these dentures. Structural defects tolerability is in relation with tensile strength area and is important for durability of complete dentures.

Objectives

Objectives: The aim of study was to evaluate fracture behavior of visible light-cured urethane dimethacrylate resins (Eclipse), used in Complete dentures technology, through structural flaw defection.

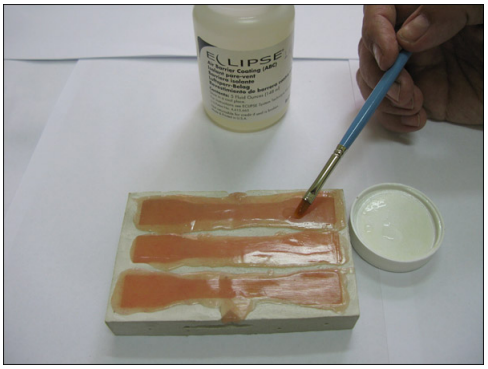


Fig. 1: Samples

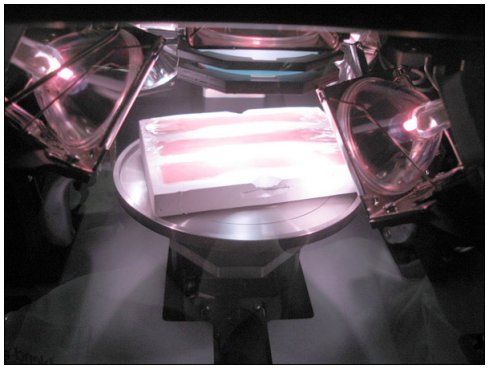


Fig. 2: Light curing equipment, Eclipse Processing Unit II

Fig. 3: Mechanical testing equipment Zwick Roel

Material and Methods

There were evaluated 30 samples(5mm×30mm×2mm) of Eclipse Resin System(Base Plate, Set Up, Contour Resin), light-cured in Processing Unit II. The determination of mechanical characteristics was evaluated with a Zwick Roel device, equipment with specialized software. Analysis of fracture behavior was performed with an Olympus type SZX7 stereo-microscope, which has image processing software (QuickphotoMicro2.2), through which defects dimensions were quantized.

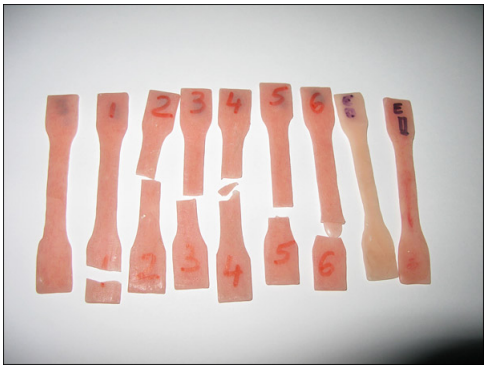


Fig. 4: Samples fractures

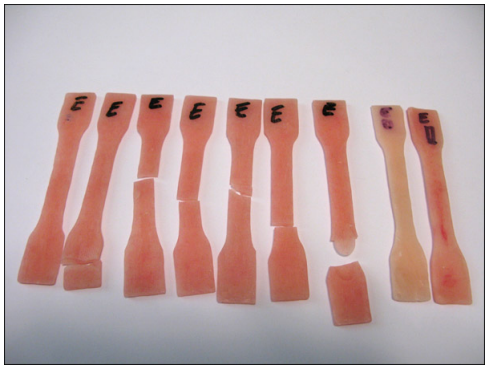


Fig. 5: Samples fractures

Fig. 6: Stereomicroscope Olimpus type SZX7

Results

The average mechanical characteristics of Eclipse samples were: Young's modulus: 3023MPa; tensile strength Rm=50,3MPa; total elongation At= 2,91%. Fracture of UDMA resins takes place with a small elongation before breaking. In 90% of cases, samples breaking occurs in two pieces, while in 10% in more than 2 components. On transverse section, samples breaking have an initiation zone: 15% in center and 85% at the edge. Zone of fracture propagation can be initiated centrally (dimensions of 565x1950µm), centrally and sideways (1595x8265µm), or only sideways (1685x2465µm and 1295x10539µm). Zone of final fracture is sharp, with granular aspect. All samples have defects: Base plate contains compactness defects type voids, round or elliptical, with average values of semi-axes of 2728×3329µm and A: 9081512-5569054µm²; Set up defects appear with average length of 1950×1762µm and A: 3435900µm²; Contour Resin has circular defects, average dimensions of semi-axes between 88×640µm and A: 56320-290018µm².Reinforced fibers break in the same time with polymeric matrix and have average lengths of 1446.9µm.

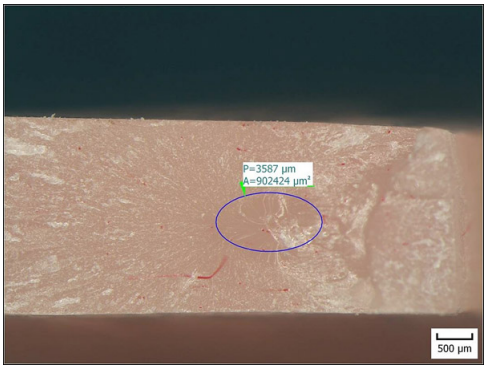


Fig. 7: Transverse section, samples breaking: a. in center

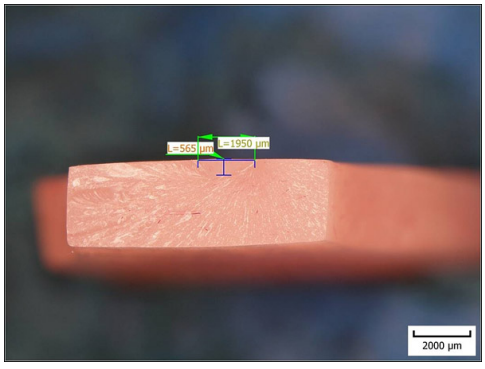


Fig. 8: Transverse section, samples breaking: a. in center

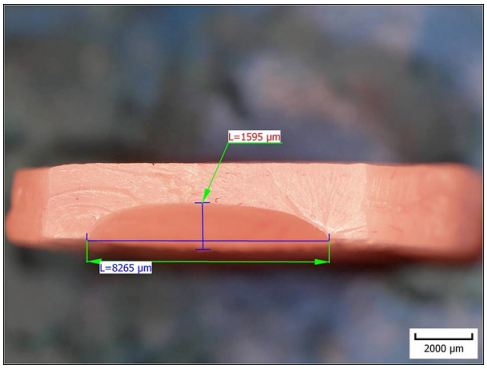


Fig. 9: Transverse section, samples breaking: b. centrally and sideways

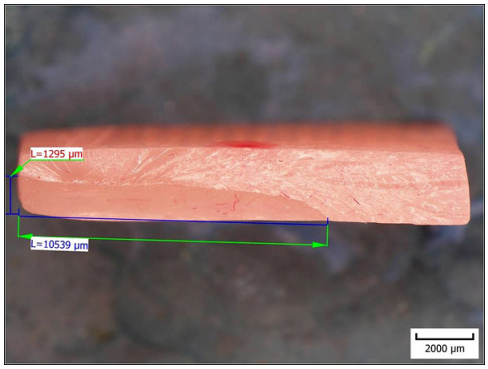


Fig. 10: Transverse section, samples breaking: b. centrally and sideways

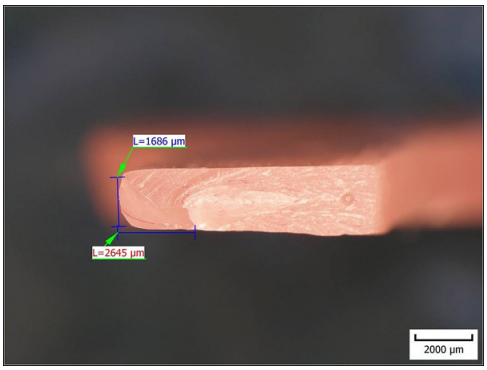


Fig. 11: Transverse section, samples breaking: c. only sideways

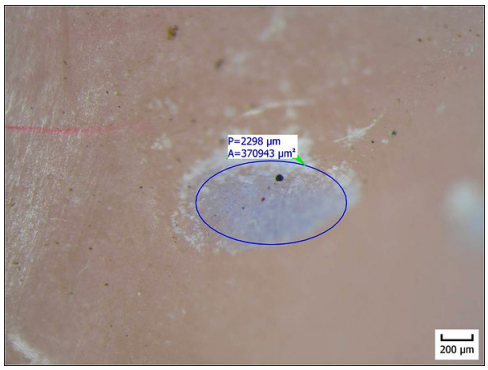


Fig. 12: Base plate compactness defects (1)

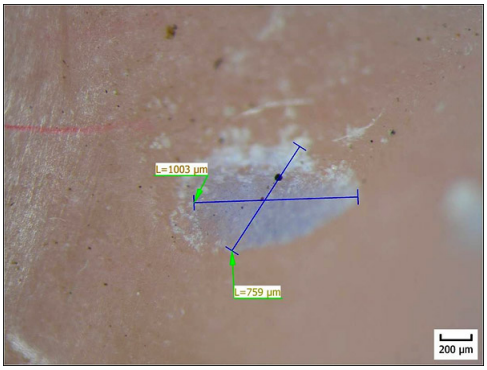


Fig. 13: Base plate compactness defects (2)

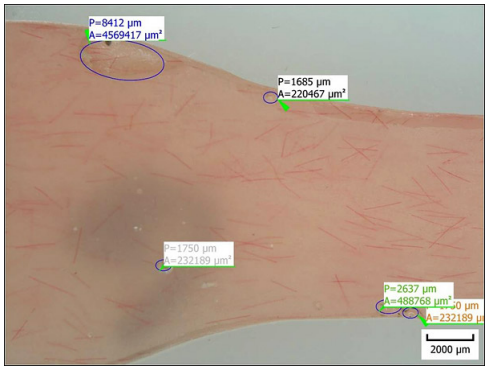


Fig. 14: Base plate compactness defects (3)

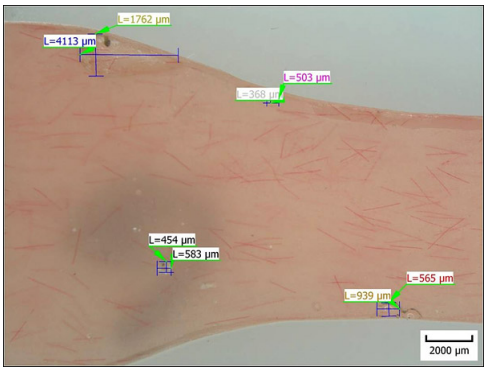


Fig. 15: Base plate compactness defects (4)

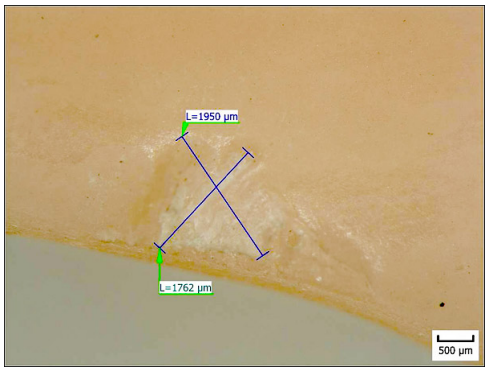


Fig. 16: Set Up compactness defects (1)

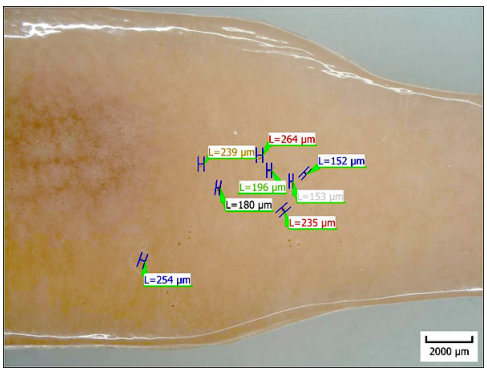


Fig. 17: Set Up compactness defects (2)

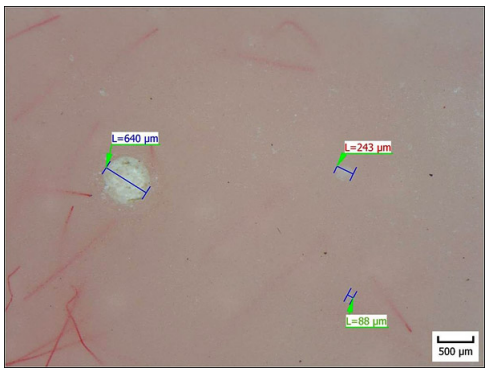
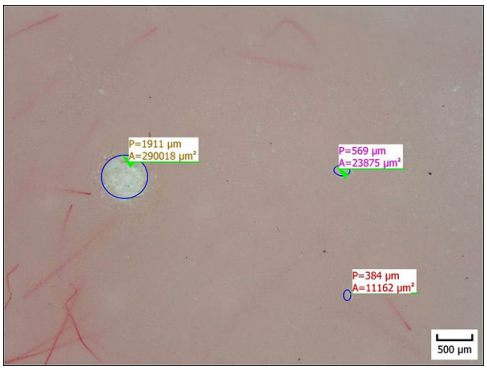


Fig. 18: Contour Resin compactness defects (1)



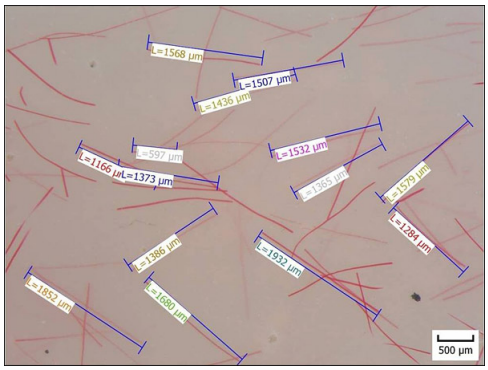


Fig. 19: Contour Resin compactness defects (2)

Fig. 20: Lengths of reinforced fibers (after break simultaneously with the polymeric matrix)

Conclusions

Fracture samples showed the brittle characteristics without massive elongation of plastic deformation before fracture. Defects from material's structure may be present due to air inclusion and absences of pressure during light- curing. They may have a negative impact on mechanical resistance of prostheses.

References

- Mese A., Guzel K. G., Effect of storage duration on the hardness and tensile bond strength of silicone- and acrylic resin-based resilient denture liners to a processed denture base acrylic resin, J. Prosthet Dent. 2008 Feb;99(2):153-9.
- Uzun G., Hersek N., Comparison of the fracture resistance of six denture base acrylic resins, J. Biomater Appl. 2002 Jul;17(1):19-29.
- Polyzois G. L,, Tarantili P. A., Frangou M. J., Andreopoulos A. G., Fracture force, deflection at fracture, and toughness of repaired denture resin subjected to microwave polymerization or reinforced with wire or glass fiber, J. Prosthet Dent. 2001 Dec;86(6):613-9.
- Memon M. S., Yunus N., Razak A. A., Some mechanical properties of a highly cross-linked, microwave-polymerized, injection-molded denture base polymer, Int. J. Prosthodont. 2001 May-Jun;14(3):214-8.
- Bortun C. M., Ghiban B., Sandu L., Faur N., Ghiban N., Cernescu A., Structural investigations concerning mechanical behavior of two dental acrylic resins, Revista Materiale Plastice, 45, nr.4, 2008, pg. 362-365, ISSN 0025-528.
- Ghiban B., Ghiban N., Bortun C. M., Faur N., Cernescu F. Fracture behavior of Some Heat Curing Dental Resins, International Bidental Conference, Porto, June 2009, Potugal.
- Bortun C. M., Ghiban B., Ghiban N., Jiga G., Investigations Concerning Mechanical and Structural Behaviour of Some Dental Resins, ICSAAMM, September 2009, Tarbes, France.
- Naik A. V., Complete denture fractures- A clinical study, The Journal of Indian Prosthodontic Society, July, 2009, vol 9., 148-150.

Acknowledgments

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