

# CORRELATION BETWEEN HARDNESS, THICKNESS AND POLYMERIZATION OF DENTAL COMPOSITES



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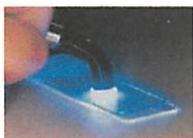
## INTRODUCTION

The diversity of dental composite materials and techniques of polymerization often depend on the evolution of light cured units. Actually, these lamps doesn't offer the same quality of dental composites photopolymerization. These discrepancies increased with the thickness, the photocured time and the work experience of each practitioners. The aim of our work is to try to understand, in a preliminary study, the real behaviour of various dental composites with three different lamps.

## MATERIALS AND METHODS

### Eight dental materials :

- Ariston® pHc (VIVADENT)
- Compoglass® F (Compomère VIVADENT)
- Dyract® AP (Compomère DENTSPLY DETREY)
- Pertac® II (composite ESPE)
- Prodigy® (Composite KERR)
- Solitaire® (HERAEUS KULZER)
- Tétric céram® (Composite VIVADENT)
- Z100® MP (Composite 3M Santé)



### Three types of lamps :

- . Classic halogen lamp :      ASTRALIS 5® (VIVADENT)
- . Progressive halogen lamp :      ELIPAR HIGHLIGHT® (ESPE)
- . Plasma lamp :      APOLLO 95 E® (DMDS)

Samples of different thickness (0, 1, 2, 3 and 4 mm), shade A3, are photocured with the three lamps. The polymerization are realized at various times and techniques of photocured as indicated here after :

#### ASTRALIS 5® Lamp :

- Four times of photocured d'insolation in each sample :
- 10, 20, 40 and 60 seconds

#### ELIPAR HIGHLIGHT® Lamp :

- Three times of photocured d'insolation in each sample :
- 20, 40 and 60 seconds

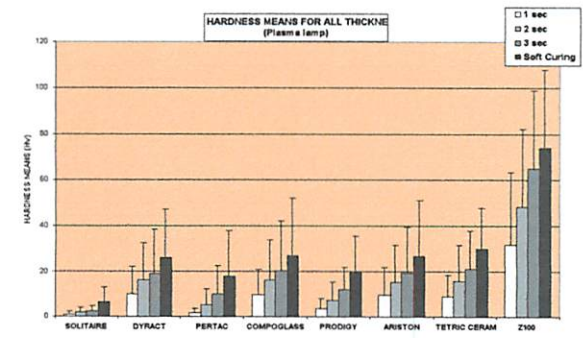
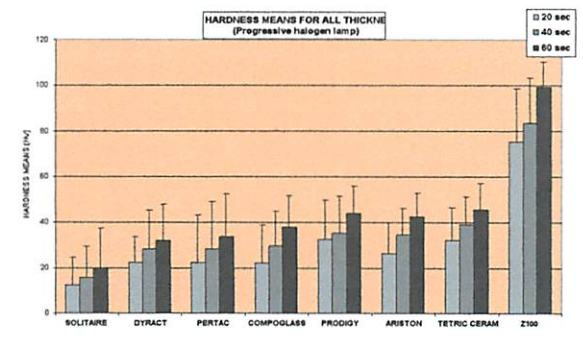
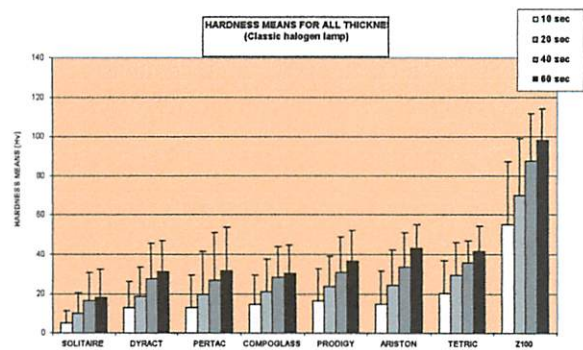
#### APOLLO 95 E® Lamp :

- Four times of photocured d'insolation in each sample :
- 1, 2, 3 and soft curing (# 5 sec)

Hardness Vickers (Hv) measurements of photocured and non photocured sides of each sample are conducted with a LEICA VHMT 30 (50 g load at 5 seconds of load-maintenance).

To avoid important discrepancies, statistical studies are obtained with the mean of ten data produced by each sample.

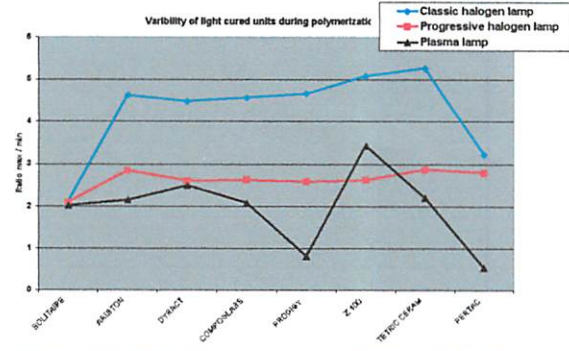
## RESULTS



➡ With all dental materials, a **same general scheme of polymerization**, at every thickness, is observed and with no difference between the three lamps

➡ Chemical reactions of each dental composites **are different in relationship with photocured insolation** for the same thickness analysis ( $p < 0,001$ ).

➡ These variations depend on the **composition** of materials and on the optimal **spectrum wavelength** efficiency more than on the type of lamp.



With **main dental materials**, ratio between hardness, photocured time and thickness point out an important **homogeneity** with the **progressive halogen lamp**.

## CONCLUSION

The halogen lamps divided the dental materials in three different sets.

The plasma shows more important discrepancies between the materials (structural composition and particular wavelength light)

The knowledge of the chemical composition of dental materials became more necessary with the choice of the lamp.

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Deadline for submission: April 15<sup>th</sup>, 2001

**A hardness analysis of four dental materials with two lamps**  
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There is a correlation between hardness and degree of conversion (Ferracane J.L. Dental Materials 1985;1:11-14). The aim of our study is to analyze the Vickers hardness in different conditions of thickness, time of cure and type of lamp. Two dental composites (Charisma® Heraeus Kulzer and Z100 MP® 3M) and two resin compomers (Compoglass F® Vivadent and Dyract AP® Dentsply Detrey) were cured with two lamps (Halogen lamp "Optilux 501® Ker/Demetron" and LED lamp "GC-e-Light® GC") at various thickness (1, 2, 3 and 4 mm) during different times and mode of polymerization. Hardness studies were conducted with a microdurimeter LEICA VHMT 30 with 50g load at 10 seconds of load-maintenance. Ten measures have been realized for each sample.

With the lamps and dental materials, the four-way analysis of variance (material, thickness exposure time and type of lamp) provides a significant difference between materials. The hardness does not follow the same progression for one material to another. On the other hand, with the LED lamp, we don't have significant difference with halogen lamp.

In conclusion, the Vickers hardness was not affected by mode of curing ( halogen lamp or LED lamp)

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