

Evaluation of the amount of free radicals in dental composite resin after photopolymerization by electronic paramagnetic resonance



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Introduction

The objective of this study is to determine the amount of residual free radicals in polymerized composites by electronic paramagnetic resonance (EPR). The EPR technique allows us to assess the efficiency of the different light curing units and to analyze the quality of the commercial composites.

Materials and methods

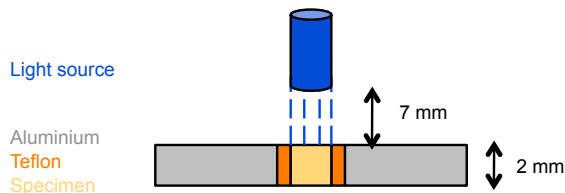
Resin composites

	Manufacturer	Shade
Ceram X	Dentsply-Caulk	M2, E2, D2
Venus Diamond	Heraeus Kulzer	A2, OM, CL
Suprême XT	3M ESPE	AE2
N'Durance	Septodont	A2

Light curing units

	Name	Manufacturer
Tungsten-halogen	Visilux	3M ESPE
2 nd generation LED	Smartlite PS	Dentsply-Caulk
3 rd generation LED	Bluephase	Ivoclar-Vivadent

Polymerization of the composites

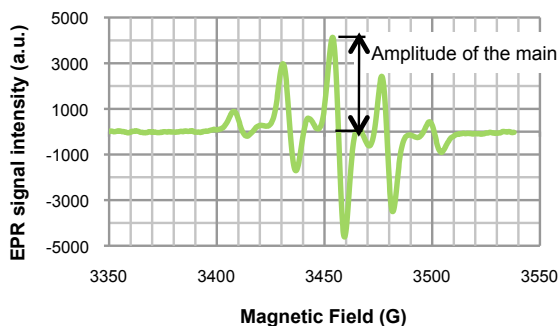


Electronic paramagnetic resonance

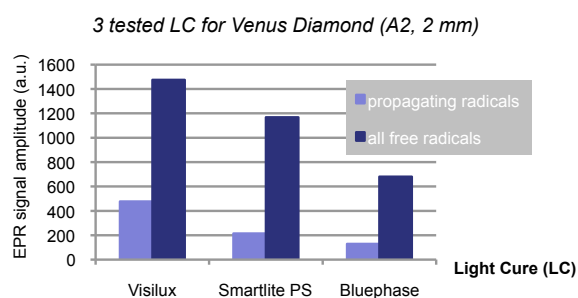
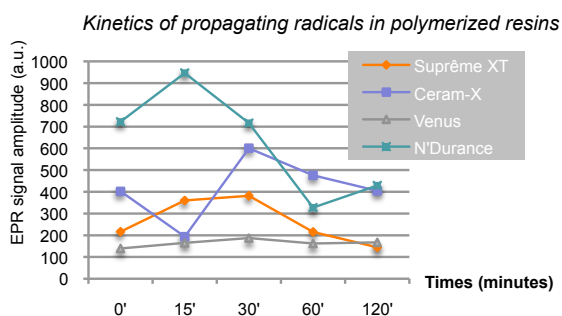
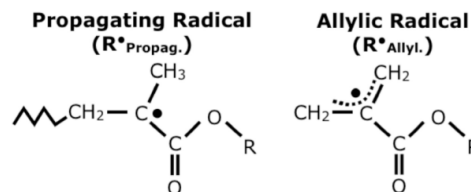
- RPE Broecker 500; 9,56 GHz; modulation 1
- Identify free residual radicals trapped in the polymerized composite
- Assess the quality of the types of resin and of the light curing units

Results

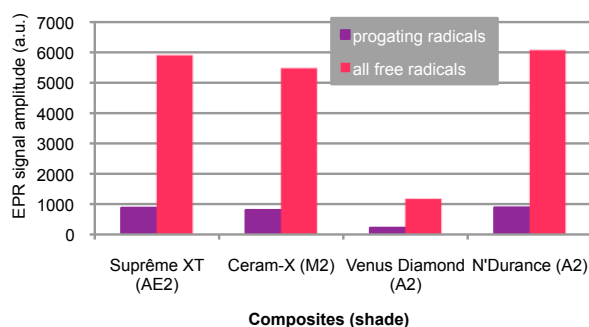
EPR spectrum



- Polymerization leads to 2 kinds of trapped free radicals [1]



Amount of radicals after polymérisation of 2 mm of 4 composites (Smartlite PS)



Conclusions

In conclusion, Venus Diamond shows lower level of residual radicals after polymerization than the others tested composites.

In addition, when this composite was light cured with 3 different light sources, the Bluephase (third generation of LED) shows the lower amount of residual radicals than others tested light curing units.

[1] Leprince *et al.*, *Acta Biomaterials*, 5, pp. 2518-2524 (2009)