HIGHLY FILLED HYBRID NANO RESIN COMPOSITES AND THEIR LIGHT CURING BEHAVIOUR INVESTIGATED BY DIELECTRIC ANALYSIS (DEA)

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ABSTRACT

Light curing resin based composites are in use in dentistry as the alternative of amalgam fillings in western countries for more than 40 years. Due to the resin shrinkage during curing and the requirement to adapt the mechanical performance of the filling to that of the tooth material such resins are highly filled [1]. With the upcoming of the nano-particles it became possible to further increase the filler content close to 90% of mass generating composites having shrinkages below 1%. With respect to the application the focus of kinetics investigations laid on the achievement of maximum degrees of conversion [2]. In spite of the long usage of such resins not much attention was given to the phases of initiation and primary curing and its consequences for the structure development in the resin composite. The DEA can give deep insights in processes taking place at the early stages of curing after irradiation. The initiation phase is prolonged and the reaction rate is decreased significantly with increasing distance from the surface, Fig 1 and 2. These results lead to the conclusion that the molecular resin structure must differ significantly the deeper one goes within the sample. Furthermore, a model is developed in order to evaluate the ion viscosity curve measured by DEA, and the kinetics data of a micro and a nano-hybrid composite are determined.

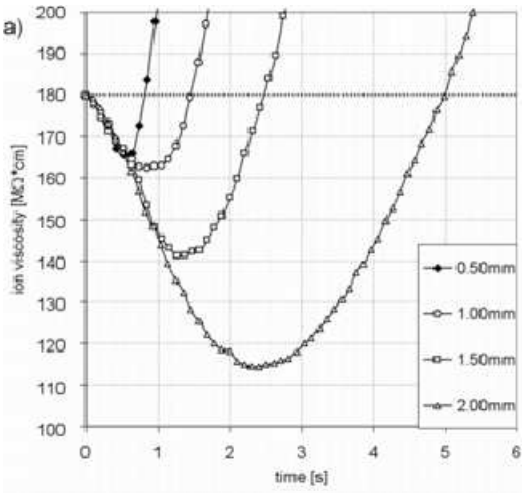

Fig. 1: Ion viscosity during initiation

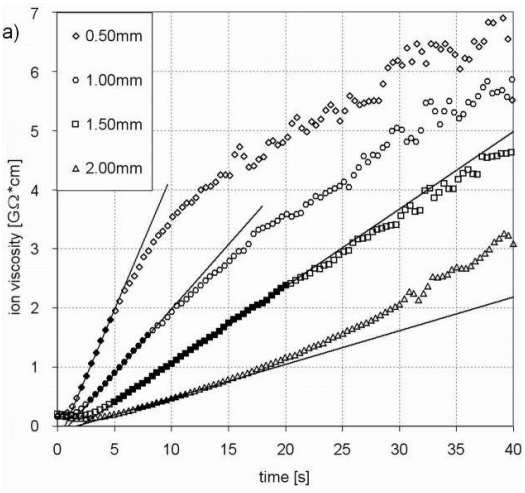

Fig. 2: Ion viscosity during polymerization

Acknowledgement:

References

[1]Watts, D.C., Dental Restorative Materials, Mat.Sci.&Tech., Vol14, Medical and Dental Materials, VCH Weinheim **1992**, 214

[2]Ferracane, J. L., Correlation between hardness and degree of conversion during the setting reaction of unfilled dental restorative resins, DentMat, Vol1, **1985**, 11