



A Study on Curing and Thermal Behavior of Cyanoacrylate/SiO₂ Nanocomposite

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Abstract

Objective(s)

Cyanoacrylate has found many applications in medicine and dentistry due to its bacteriostatic behavior. Some examples of dental applications are tooth pit fissure sealant, tooth desensitizer and tooth cavity treatment. Since there is no research on curing, thermal behavior and degradation temperature of cyanoacrylate in the presence of nano-size SiO₂, the main goal of this study is to fill the literature gap appeared in this issue.

Materials and Methods

In order to study curing and thermal behavior of Cyanoacrylate/SiO₂ nanocomposite, para-toluene sulphonic acid and caffeine were used as polymerization inhibitor and initiator respectively. 1 wt% of acid and 1.5 wt% of caffeine were solved in the cyanoacrylate and then nano powders were added to it. Isothermal DCS and TGA tests were utilized to determine curing time, released energy during polymerization and degradation temperature of nanocomposites.

Results

The results of Isothermal DSC showed that an increase in nano-size SiO₂ content decreases the initiation time, duration and energy release of polymerization. It was also obtained that the presence of nano-size SiO₂ particles postpones the degradation of cyanoacrylate and promotes its degradation temperatures in comparison with pure cyanoacrylate.

Conclusion

The summary of current research indicates that the curing time of cyanoacrylate nanocomposite reinforced with nano-size SiO₂ is faster than that of neat cyanoacrylate. Thus, it can be used easier in dental applications. It is also revealed that the nanocomposite studied in the current research can be use at higher temperature due to its higher degradation temperature.

Keywords: Cyanoacrylate, Nanocomposite, SiO₂, Thermal behavior

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