Effect of thermocycling on the fracture toughness of composites

Content

Fracture toughness has been recognised to be one of the most important mechanical property for retorative materials. It is the aim of this study to investigate the effect of thermocycling an fracture toughness of a range of dental composites; P50(P)[1] , Silux Plus(S)[2], Heliomolar(H)[3], Clearfil Photo Posterior-light activated(CLA)[4] and Clearfil Posterior-chemically activated(CC)[3.] 110 rectangular pre-notched specimens was prepared for each material utilising a stainless steel mould. The specimens were divided into 11 groups of 10 each. Test groups 1-6 were subjected to 0, 250, 500, 750, 1000 and 10,000 thermal cycles respectively. All specimens were subjected to a 3 point bend test and loaded at a crosshead speed of 1mm/min^{-1} on an Instron Testing Machine. The fracture toughess of all materials decreases with the number of thermal cycles and length of water storage except for CC where the fracture toughness increases during the earlier stages of thermocycling and water storage. However the lowest fracture toughness values were for groups 6 and 11. One way analysis of variance showed that Group 1 was significantly different from groups 6 and 11 ($P<.05$), the thermally cyled and the water storage groups were not different from each other for al materials. The decrease in fracture toughness exhibited by all light activated composites could be explained by interfacial stress formation and resin-filler debonding while the increase in fracture toughness during the earlier stages of thermocycling and water storage of chemically-activated composite be explained by continued polymerisation. Thermocycling did not cause any significant in fracture toughness composites over and above by water storage.

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21 **Effect of Thermocycling on the Fracture Toughness of Composites.** N.H Abu Kasim* and J.F McCabe. Dental Faculty, University of Malaya, Malaysia and Dental School, University of Newcastle upon Tyne, UK

Fracture toughness has been recognised to be one of the most important mechanical property for restorative materials. It is the aim of this study to investigate the effect of thermocycling on fracture toughness of a range of dental composites; P50(P)[1], Silux Plus(S)[2], Heliomolar(H)[3], Clearfil Photo Posterior-light activated(CLA)[4] and Clearfil Posterior-chemically activated(CC)[5]. 110 rectangular pre-notched specimens was prepared for each material utilising a stainless steel mould. The specimens were divided into 11 groups of 10 each. Test groups 1-6 were subjected to 0, 250, 500, 750, 1000 and 10,000 thermal cycles respectively. Each cycle consisted of 1min immersion time of 50 seconds per change. The control groups 7-11 were stored in water at 37°C for a time equivalent to complete 250, 500, 750, 1000 and 10,000 thermal cycles respectively. All specimens were subjected to a 3 point bend test and loaded at a crosshead speed of 1mm min^{-1} on an Instron Testing Machine. The fracture toughess of all materials decreases with the number of thermal cycles and length of water storage except for CC where the fracture toughness increases during the earlier stages of thermocycling and water storage. However the lowest fracture toughness values were for groups 6 and 11. One way analysis of variance showed that Group 1 was significantly different from groups 6 and 11 ($P < .05$), the thermally cycled and the water storage groups were not different from each other for all materials. The decrease in fracture toughness exhibited by all light acitvated composites could be explained by interfacial stress formation and resin-filler debonding while the increase in fracture tooughness during the earlier stages of thermocycling and water storage of chemically-activated composite be explained by continued polymerisation. Thermocycling did not cause any significant reduction in fracture toughness composites over and above by water storage.

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