AN EVALUATION OF PROPERTIES OF NEW FORMULA OF RESIN-MODIFIED AND CONVENTIONAL GLASS IONOMER CEMENTS

A Thesis

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Abstract

The aim of this study was to prepare two types of resin-modified and conventional cements. First type was containing powder (II) with (0.57) alumino-silicate ratio and (29.2) fluoride contents. The second type was containing powder (I) with (0.68) alumino-silicate ratio and (42.2) fluoride contents. Two types of commercial cements were used as control for comparison purposes.

Six types of cements were tested in this study; three of them were light-cured resin-modified, other three were chemical-cured conventional cements.

(3,4-epoxycyclohexylmethyl-3,4-epoxycyclohexanecarboxylate) resin material with potential to expand on light-curing was added to some part of the liquids to see if it can initiate expansion in the matrix of the tested cements.

Compressive strength, diametral tensile strength, shear bond strength and microhardness tests were used to evaluate the mechanical properties of the tested cements.

Fluoride and calcium ions release, water sorption, cement solubility setting time, working and initial hardening times, setting dimensional changes, tissue reaction and particle size analysis tests were also used.

The results showed increased values of shear bond strength, compressive strength and diametral tensile strength of the resin-modified than those of conventional cements. Conventional cements showed higher microhardness values than resin-modified cements.

Results showed increased fluoride and calcium ions release in addition to increased values of water sorption, cement solubility and tissue reaction of the prepared cements.

Working time measurements that was carried out for conventional chemical-cured cements showed the following results: cement (4) had five minutes, cement (5) had two minutes and cement (6) had 3.5 minutes.

Initial hardening time test was carried out for resin-modified light-cured cements, and the results showed the following results: cement (1) had six minutes, cement (2) had 5.5 minutes and cement (3) had 3.5 minutes.

All light-cured cements showed 60 minutes setting time. Setting time of the conventional cements showed that cement (4) had 4.5 minutes, cement (5) had six minutes and cement (6) had five minutes.

The greatest value of shrinkage was recorded for cement (6) and the lowest was recorded for cement (3).

Particle size analysis showed that powder (I) had (0.98 µm) mean particle size, powder (II) had (1.00 µm), cement (3) powder had (1.02 µm) and cement (6) powder had (1.39 µm).

Within the limitation of the present study, the results revealed that the prepared cements were with some superior properties specially those of fluoride and calcium ions release. It was also concluded that increasing alumino-silicate ratio of the cement powder had no effect on improving cement properties. Further work may be required to add activators and initiators to the cement formula which may increase the cement quality.