

A Comparison of the Composition of Four Commercially Available Light Cured Special Tray Materials

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INTRODUCTION

Light-polymerized composite resin special tray materials were first discussed by Wirz et al.⁹ in 1990. This current study investigated the structural characteristics and elemental composition of four visible light-cured resin composite (VLC) special tray materials.

METHOD

The chosen VLC resin composites were: i. Light tray (Ivoclar), ii. Light cured tray wafers (Bracon), iii. Magilight (Schottlander) and, iv. Palatray (Kuzler). Sample wafers were polymerised following manufacturers' recommended procedures i.e. 5 minutes each side for the first three materials, (total of 10 minutes), and 6 minutes per side for Palatray (total of 12 minutes). Cured samples were imaged in the SEM (x35, x50, x100, x250, x500, x1000) with both secondary and backscattered images^{3,6,8}.

Elemental composition was determined using the EDX microanalysis^{3,7} and the results were expressed in weight percentage per element. Interpolation of the samples' X-ray spectra was used for quantitative and qualitative analysis of the elements present in the samples. Analyses involved the following areas for each sample: One 5 cm box x250, one point on particle x5000, and one point on non particle x5000.

RESULTS

Figures 1-4 depict backscattered SEM images of fractured surfaces (x250) of Bracon, Ivoclar, Schottlander and Kulzer VLC special tray materials respectively. The white particles represent the fillers whereas the remainder represents the resin matrix. Note the differences in the sizes and distribution of the filler particles within sample and between samples. In all 4 materials, all particles appear to have a round or elliptical shape, and similar sizes for similar size fillers.

Images of resins i,ii,iii appear to be similar, regarding size, shape and distribution of inorganic filler particles. Sample iv showed a slight difference in the distribution of fillers. The resin matrices were similar in appearance for samples i,ii,iii, however, they had a different appearance compared to Palatray resin matrix. (Fig 1, 2, 3, 4)

EDX also, demonstrated similarity in elemental composition in resins i, ii, iii. (Figures 5, 6, 7). Elements found were Sodium, Silicon, Magnesium and Calcium (Table 1). Some differences in mass percentage per element could be observed in resin iv. Two further elements were traced in resin iv (Figure 8) filler particles: Sulphur (0.57% minimum to 13.42% maximum) and Chlorine (0.41%).

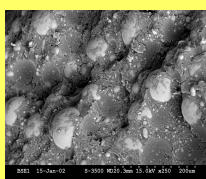
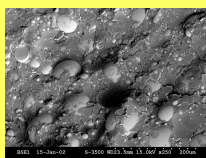


Fig 1. Bracon: SEM image (Backscatter) x250. Field Width 400µm



Εικ 2. Ivoclar: Εικόνα οπισθοσκεδαζόμενης δέσμης ηλεκτρονίων x250. Εύρος πεδίου 400µm

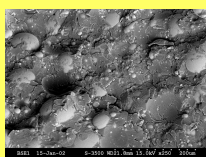


Fig 3. Schottlander: SEM image (Backscatter) x250. Field Width 400µm

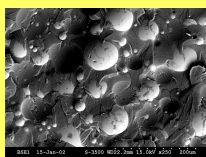


Fig 4. Kulzer: SEM image (Backscatter) x250. Field Width 400µm

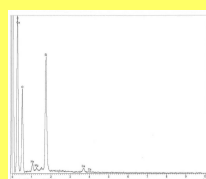
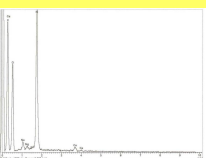


Fig 5. Bracon: X-ray spectrum



Εικ 6. Ivoclar: Φάσμα ακτίνων X

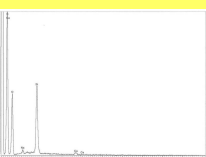


Fig 7. Schottlander: X-Ray spectrum

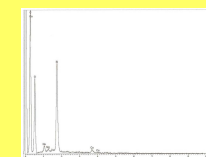


Fig 8. Kulzer: X-ray spectrum

Table 1

Elemental composition of cured samples determined by EDX analysis expressed as weight percentage.

SPECTRUM	Na	Mg	Si	Ca
Bracon	3.05	0.74	26.40	1.35
Ivoclar	2.85	0.78	28.10	1.33
Schottlander	2.98	0.78	24.88	1.32
Kulzer	2.15		24.12	1.16

CONCLUSIONS

The resin matrices appear similar in composition and surface texture with the exception of Palatray resin matrix, which depicts a different fractured surface texture. This may suggest similarities in monomer composition and monomer conversion of the uncured materials^{1,2,3,4,5}. There are also similarities in composition, size, shape and distribution of inorganic fillers. However, Palatray fillers, although similar in appearance to other samples in SEM images, seem to contain two additional elements, sulphur and chlorine. More research is suggested to determine composition and behaviour of these resins.

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