aggregate of small lamellar crystallites and so would contain imperfections. Although the signal intensity was reduced to ~ x 0.03 on sintering, the relative generation rate of oxygen vacancies in C′ was large, so it is expected that sintering or crystalline growth from the surface [9] may move various imperfections into the centre of powder particles and the accumulated defects formed would provide ample space for interstitial oxygen.

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Co-polymer impregnation of gypsum casts

In a previous communication [1], it was reported that the properties of gypsum casts could be vastly improved by the incorporation of a polymer, poly(methylmethacrylate), into the inorganic matrix. The reported method involved the infiltration of an activated monomer system into the porous matrix, which would polymerize under ambient conditions in under 3 h.

Further work on the production of polymer impregnated gypsum (PIG) has produced gypsum casts with superior mechanical properties to those obtained on impregnation with the monomer alone [2]. It has been found that the incorporation of a co-monomer, namely ethylene glycol methacrylate, enhances the properties of PIG over those of the methyl methacrylate system [3]. This co-monomer when added to the methyl methacrylate activated system reduced the polymerization period to less than 1.5 h and it is also believed that the introduction of the ethylene gylcol dimethacrylate not only improves the immediate strength characteristics of the composite material, but also the durability of the material due to its secondary cross-linking.

Some work [4–6] has been carried out on the co-monomer ethylene gylcol dimethacrylate, but the concentration of the co-monomer appears to have been arbitarily chosen. In the present work it has been demonstrated that there is a critical maximum concentration of co-monomer, of the order of 2 to 3 per cent, necessary for the beneficial improvements.

In dental applications it is a prime requirement for the cast material to show both dimensional accuracy and stability, and it is believed that this present treatment could find application to such materials. The gypsum casts were prepared from unmodified industrial plaster of Paris, so as to contain a variable water–powder ratio (Table I). After allowing the samples to hydrate within the moulds, they were dried at 100° C for 24 h, allowed to cool to room temperature and stored over silica in a vacuum desiccator prior to impregnation. The samples were then immersed in an impregnation bath containing the activated system, which comprised methyl methacrylate (100 parts), lauroyl peroxide (4 parts), N,N′-dimethyl-*p*-toluidine (4 parts) and ethylene gylcol dimethacrylate (1 to 10 parts, wt/wt). In order to aid the solubility of the initiator and the promotor in the co-monomer solution, these constituents were dissolved in the methyl methacrylate prior to the addition of the dimethacrylate. After about 30 min the temperature was observed to rise and after about 45 min the samples were removed and polymerization allowed to continue at ambient temperature for approximately 30 min.

Some mechanical properties of the impregnated

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TABLE I The effects of polymer impregnation on the properties of gypsum casts.

(a) Sample dimensions

Test	Sample size
Compressive strength	25 mm o.d. × 45 mm cylinders.
Tensile strength	25 mm × 25 mm British Standard 1881
Flexural strength	25 mm × 25 mm × 100 mm
Abrasion resistance	25 mm × 25 mm × 25 mm

(b) Compressive strength (N mm^{-2})

Water–powder ratio	Control	Impregnated copolymer (%)				
		1	2	3	5	10
0.50	10.5	28.5	29.5	25.6	25.2	25.1
0.60	8.64	27.2	28.5	28.3	24.1	24.1
0.70	6.56	30.8	30.9	30.9	29.1	28.2
0.80	6.16	40.6	40.8	38.8	37.2	35.1

(c) Tensile strength (N mm^{-2})

Water–powder ratio	Control	Impregnated copolymer (%)				
		1	2	3	5	10
0.50	1.1	5.8	8.2	8.2	7.9	4.5
0.60	0.99	6.4	7.2	7.1	7.0	6.9
0.70	0.76	6.72	7.5	6.9	7.0	6.9
0.80	0.60	6.16	6.3	6.2	6.4	6.2

(d) Abrasion resistance (% weight loss)

Water–powder ratio	Control	Impregnated copolymer (%)				
		1	2	3	5	10
0.50	6.4	0.9	0.8	0.7	0.7	1.1
0.60	8.6	1.1	0.6	0.4	0.6	1.2
0.70	9.2	1.7	0.7	0.4	0.6	1.5
0.80	9.3	1.9	0.8	0.9	1.0	1.4

(c) Flexural strength (N mm^{-2})

Water–powder ratio	Control	Impregnated copolymer (%)				
		1	2	3	5	10
0.50	0.74	3.2	3.8	3.6	3.2	3.1
0.60	0.67	3.4	3.9	3.2	3.1	2.8
0.70	0.40	4.2	4.8	3.9	3.8	2.5
0.80	0.32	1.41	2.8	2.9	3.2	2.1

materials and control specimens were measured using an Instron testing machine. Abrasion resistance to a silicon carbide rotating disc under a 1 kg load was measured in an analogous way to that reported by Earnshaw [7]. The results obtained (Table I) show the relative improvements in properties due to copolymer impregnation of gypsum.

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Comment on "A study of the homogenization process of aluminium–zinc alloys"

In their recent paper Ciach *et al.* [1] report that the micro-segregation of an alloy of aluminium–40 at % zinc was extremely resistant to homogenization at 360° C. The authors suggest that this resistance to homogenization is due to the very low value of the Darken non-ideality factor $(1 + \mathrm{d}\ln\gamma_{\mathrm{Zn}}/\mathrm{d}\ln N_{\mathrm{Zn}})$ [2], where γ_{Zn} and N_{Zn} are respectively the activity coefficient and atomic fraction of zinc in the solid solution. The purpose of this letter is to point out that this is expected to be a general phenomenon in alloys showing unmixing, and potentially spinodal decomposition [3], in the solid state, as was predicted by Martin and Doherty [4]. Other binary alloys where this type of resistance to homogenization of microsegregation would be expected are for example Au–Ni, Au–Pt, Nb–Zr, Ta–Zr and for non-metallic systems, NaCl–KCl.

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