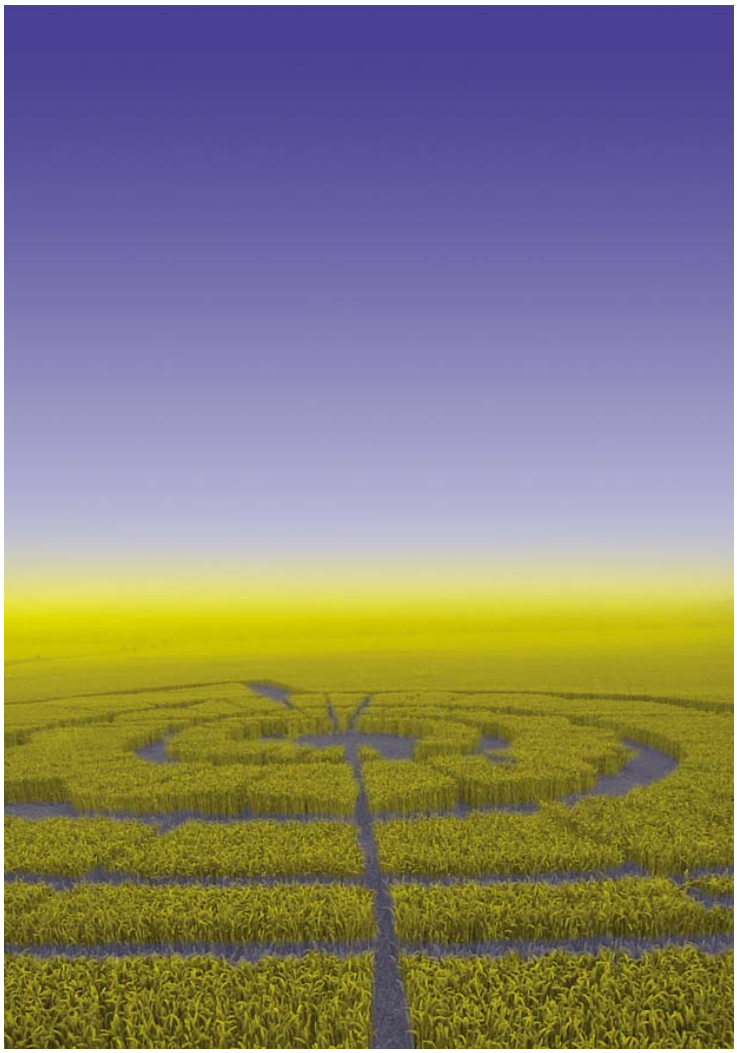
Total Etch



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1 Introduction / Description of the Total-Etch Technique

Buonocore [1] was the first to discover that enamel surfaces could be effectively etched with phosphoric acid. His findings opened the door to the development of a trendsetting new generation of dental adhesives. Buonocore's starting idea was borrowed from the varnish and lacquer industry, where phosphoric acid was commonly used for etching metals to ensure a better adhesion of paints and coatings. Buonocore showed that acrylic resin adhered to enamel after conditioning the enamel with 85% phosphoric acid for 30 seconds.

When enamel is etched, a large number of microscopic irregularities produce on the enamel surface. Low-viscosity composite material may penetrate these micro-spaces and, once cured, provide mechanical retention [2, 3]. Typically, crystalline hydroxyapatite prisms of the enamel surface are dissolved (fig 1). Depending on the acid concentration and duration of treatment, the acid may also dissolve the matrix surrounding the crystallites.

Silverstone [4] reported that an acid concentration of between 30% and 40% produced the most effective retentive pattern on enamel surface. Different etching times do not significantly influence the etching effect. Laboratory tests revealed that there is no significant difference in shear bond strength or marginal seal whether the enamel is etched for 15 sec or for 60 sec [5,6,7]. In the meantime, clinical trials evaluating the etching effect of weaker acids on enamel have also been conducted [8,9]. The clinical consequences of these weaker acids have not been described as yet.

The dental hard tissues are not only composed of enamel, but also of dentin. Compared with enamel, dentin is a much more complex substance. A sufficiently strong phosphoric acid solution dissolves the smear layer resulting from mechanical treatment and demineralises the dentinal surface, so that the dentinal tubules become accessible (fig 2). A primer with good wetting properties may thus penetrate the tubules and the micro-spaces between the exposed collagen fibres. After polymerization, the tags of resin that form act as strong mechanical retainers. In addition, the bio-film is removed from the tooth surface due to the effect of the phosphoric acid.

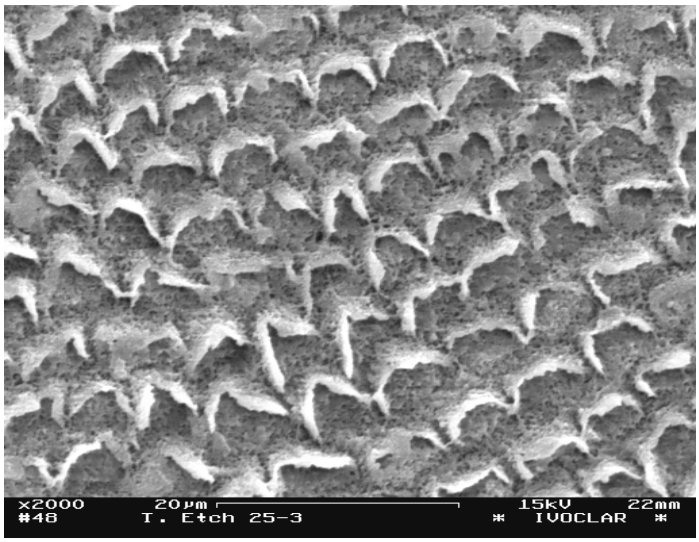

Fig 1: Acid-etch pattern on enamel after the application of Total Etch

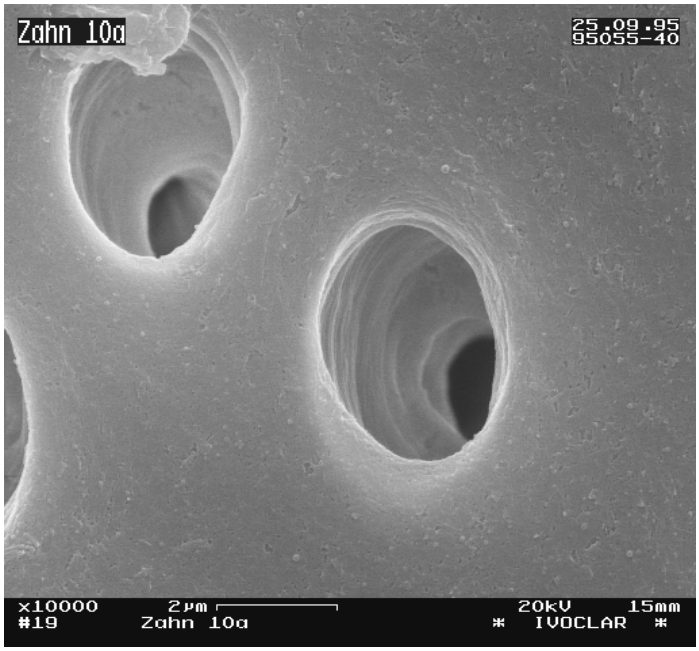

Fig 2: Dissolved dentin with the exposed surface openings of the dentinal tubules

2 Technical Data Sheet

Total Etch is 37% phosphoric acid in water. In addition, it contains inorganic fillers and a water-soluble polymer to ensure a consistency that is easy to apply.

Standard Composition (in weight %)

Water dist.	44.3
Phosphoric acid (85 %)	43.5
Thickener	12.0
Pigments	< 0.2

Physical properties

Enamel bond strength in conjunction with Excite (immersion in water for 24 hours)	25 MPa
Dentin bond strength in conjunction with Excite (immersion in water for 24 hours)	32 MPa
Consistency (Penetrometer, 24 hours)	23.1 mm

3 Literature

[1] M. G. Buonocore; J. Dent. Res. 34, 849 (1955)

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[3] M. G. Buonocore, A. Matsui, A. J. Gwinnett; Arch. Oral Biol. 13, 61 (1968)

[4] L. M. Silverstone; Caries Res. 8, 2 (1974)

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[6] P. A. M. Bastos, D. H. Retief, E. L. Bradley, F. R. Denys; Am. J. Dent. 1, 151 (1988)

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[9] E. J. Swift, B. C. Cloe; Am. J. Dent. 6, 162 (1993)

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