

Admira Fusion – Tensile bond strength values

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Admira Fusion is the first purely ceramic-based restorative material and unites two outstanding innovations: Nanohybrid and ORMOCER® technology. In addition to very low polymerisation shrinkage of just 1.25% by volume and low shrinkage stress, the biocompatibility of the material is another outstanding characteristic. Admira Fusion is based on pure silicate technology, i.e., all the components of the material are silicate-based. Even the resin component, the ORMOCER® resin, is characterised by a highly cross-linked silicate backbone, which makes it possible to avoid the use of conventional monomers completely. Nevertheless, Admira Fusion is still compatible with all standard adhesive systems. To back up this statement, comparative tensile bond strength tests were conducted at the University of São José dos Campos and the University of Campinas in Brazil. Torres et al. studied the tensile bond strength values of two universal adhesive systems in combination with one ORMOCER®-based and one methacrylate-based restorative material (Study 1).^[1] Giannini et al. studied the micro-tensile bond strengths of six different adhesive systems in combination with the ORMOCER®-based restorative material Admira Fusion (Study 2).^[2]

Design of Study 1

Following appropriate storage, 80 freshly extracted bovine teeth were cleaned, prepared, divided into two groups (n = 40) (enamel and dentine) and specifically prepared. The test specimens were embedded in an acrylic resin matrix and divided into two subgroups (n = 20) for each substrate and adhesive system (Futurabond M+ and Scotchbond Universal) respectively. Each universal adhesive system was applied in the self-etch mode in accordance with the manufacturer's specifications. A 2 mm layer of the restorative material was then applied to the test specimen with the aid of a silicon matrix and light-cured for 20 seconds. After the matrix was removed, the block was light-cured again for a further 20 seconds. The tensile bond strength measurement was performed with a universal testing machine (DL200MF, Emic).

Table 1: Overview of the materials used

| Restorative material | Admira Fusion (VOCO) | | Filtek Z 350 (3M ESPE) | |
|---------------------------------------|----------------------|---------|------------------------|---------|
| Adhesive system | Enamel | Dentine | Enamel | Dentine |
| Futurabond M+ (VOCO) | n = 10 | n = 10 | n = 10 | n = 10 |
| Scotchbond Universal (3M ESPE) | n = 10 | n = 10 | n = 10 | n = 10 |

Results of Study 1

The tensile bond strength values depicted in the graph in Figure 1 do not differ significantly for either the tested restorative materials or the adhesive systems. Both the universal adhesives employed display excellent adhesion values both in combination with the ORMOCER®-based restorative material Admira Fusion and with the methacrylate-based restorative material Filtek Z350.

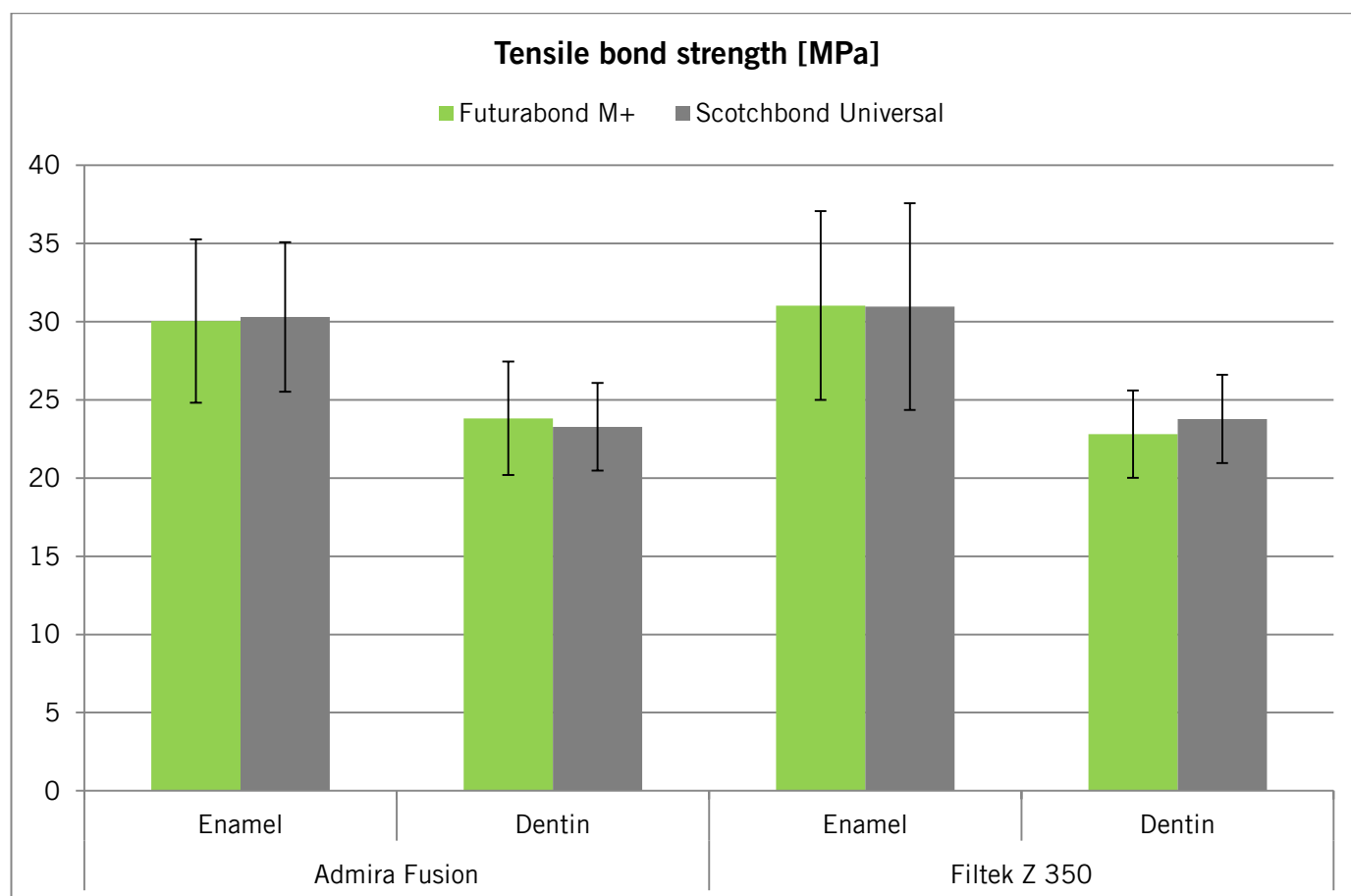


Figure 1: Tensile bond strength values on enamel and dentine in [MPa]. The universal adhesives used were Futurabond M+ and Scotchbond Universal; the restorative materials used were Admira Fusion and Filtek Z 350.

Design of Study 2

The adhesive systems listed in Table 2 were applied to the correspondingly prepared dentine test specimens in the self-etch mode in accordance with the manufacturer’s specifications. Admira Fusion was used as the restorative material for all the tests. It was applied to the respective adhesive layer and light-cured in accordance with the manufacturer’s specifications. The test specimens were immersed in water for 24 hours and then the tensile bond strength tests were performed with a universal testing machine. Fig. 2 shows the values obtained.

Table 2: Overview of the adhesive systems used

| Group | Adhesive system |
|-------|---------------------------------------|
| 1 | Futurabond M+ (VOCO) |
| 2 | Futurabond U (VOCO) |
| 3 | Clearfil SE Bond (Kuraray) |
| 4 | Optibond All-in-one (Kerr) |
| 5 | Scotchbond Universal (3M ESPE) |
| 6 | Adhese (Ivoclar Vivadent) |

Results of Study 2

Admira Fusion achieved impressive micro-tensile bond strength values on dentine with all the adhesive systems employed in the test. The long-term integrity of fillings and restoration margins depends on the strength of the bond between the dental hard tissue and the adhesive, and this is of course determined by the quality of the adhesive system, among other factors. However, the bond produced between the adhesive and the restorative material is just as important for the long-term integrity of restorations. The measured values are an impressive testament to the compatibility with the adhesive systems tested here. The

universal compatibility applies to all the main adhesive systems on the market, irrespective of whether they are self-etch, total etch or universal adhesives.

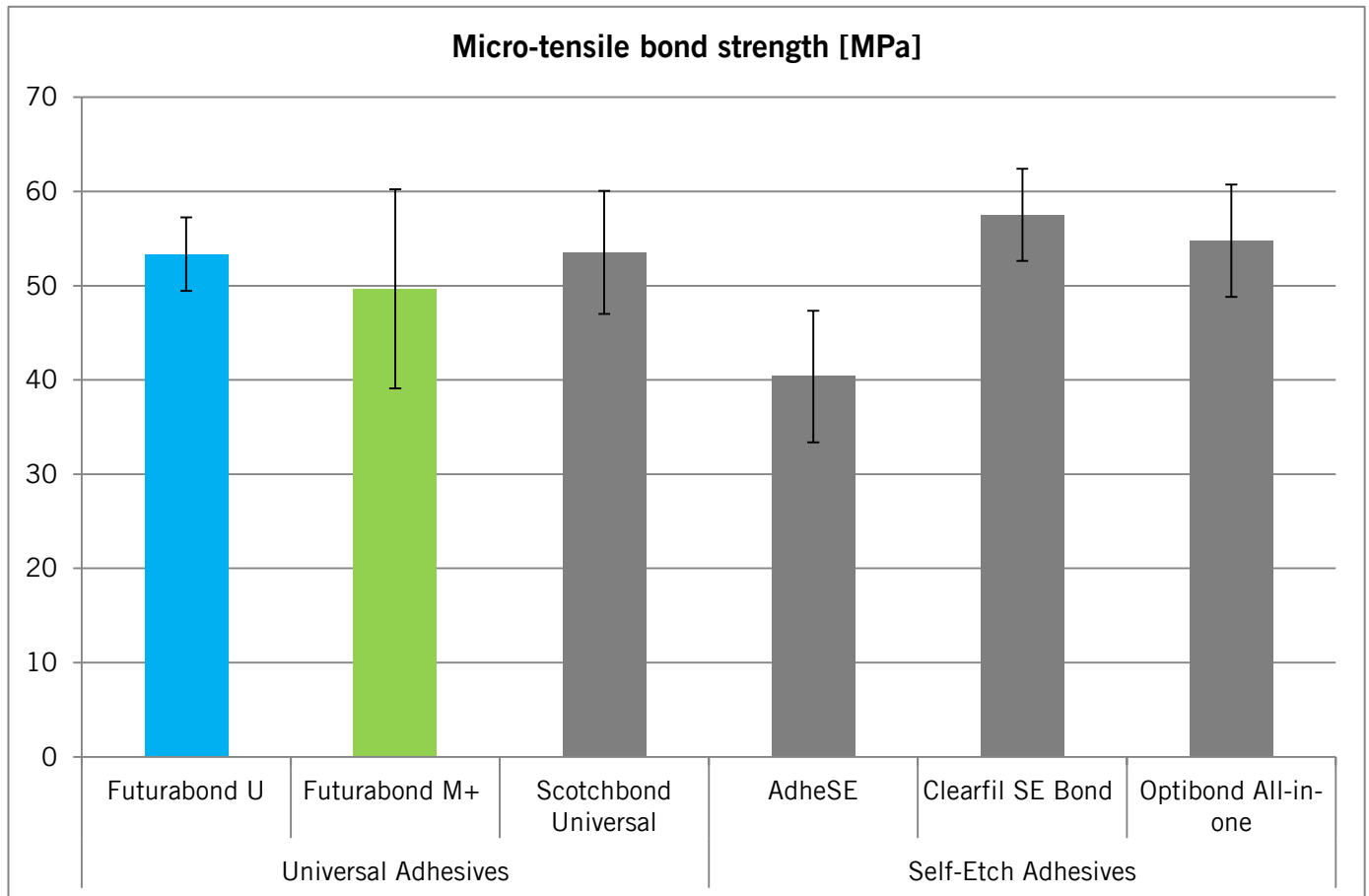


Figure 2: Micro-tensile bond strength values on dentine [MPa]. Restorative material used: Admira Fusion

Conclusion: With Admira Fusion, the world's first purely ceramic-based restorative material, VOCO avoids the addition of conventional monomers completely. In addition to its wide range of positive properties, Admira Fusion is also compatible with all adhesive systems. When the adhesive system and restorative material are used correctly, biocompatible restorations with long-term integrity are assured.

[1] Torres CRG, Gutierrez NC, Martinelli CD, Pucci CR, Borges AB *Bond Strength of Pure Ormocer x Methacryate Composites to Enamel/Dentin*, J Dent Res 94 Spec Iss A, 2082, 2015

[2] Giannini et al., University of Campinas, Brazil, Report sent to VOCO, 2015