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[\[PDF \(765K\)\]](#) [\[References\]](#)**Design of a new dental adhesive — Effect of a water-soluble sodium acylphosphine oxide with crown ether on adhesion to dental hard tissues**[Kunio IKEMURA](#)¹⁾, [Kensuke ICHIZAWA](#)¹⁾, [Kiyomi FUCHIGAMI](#)¹⁾, [So ITO](#)¹⁾ and [Takeshi ENDO](#)²⁾

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Abstract:

The behavior of water-soluble photoinitiators with crown ethers in dental adhesives is unknown. This study investigated the effect of sodium acylphosphine oxide (APO-Na) with crown ether in a hydrophobic adhesive on adhesion to teeth. Sodium 2,4,6-trimethylbenzoyl-phenylphosphine oxide (TMPO-Na = APO-Na) was synthesized in 67.1% yield and identified by ¹H NMR. APO-Na was dissolved in hydrophobic resins in the presence of a crown ether (ionophore effect). Thirty kinds of experimental single-step adhesives comprising APO-Na, CE, Bis-GMA, 6-methacryloyloxyhexyl phosphonoacetate (6-MHPA), and 4-methacryloyloxyethyl trimellitic acid (4-MET) were thereby prepared. Shear bond strength to unetched ground teeth was measured at a crosshead speed of 1.0 mm/min, and the data were analyzed by ANOVA. The shear bond strength results of bonding resins containing APO-Na with 18-crown-6-ether (CE-6) were significantly higher than that without CE-6 (control) ($p < 0.05$). Higher bond strength values [for enamel: BR24 at 19.3 (3.2) MPa; for dentin: BR29 at 20.2 (4.7) MPa] were achieved with the adhesives containing APO-Na, CE-6, 6-MHPA, and 4-MET. Therefore, it was found that APO-Na with CE-6 contributed to the efficient bonding performance of single-step adhesive to teeth. However, in view of the biosafety hazard posed by crown ethers, the search is still on for reagents that are biologically safer than crown ethers — but with ionophore effects — to be used in dental adhesives.

Key words:

[Water-soluble photoinitiator](#), [Sodium acylphosphine oxide](#), [Crown ether](#)

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