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Volume Page

Keyword:    [TOP](#) > [Available Issues](#) > [Table of Contents](#) > [Abstract](#)

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**Dental Materials Journal**

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[\[Image PDF \(321K\)\]](#) [\[References\]](#)**Design of New Phosphonic Acid Monomers for Dental Adhesives -  
Synthesis of (Meth)acryloxyalkyl 3-phosphonopropionates and  
Evaluation of their Adhesion-promoting Functions**[Kunio IKEMURA](#)<sup>1)</sup>, [Franklin R. TAY](#)<sup>2)</sup>, [Nonrihiro NISHIYAMA](#)<sup>3)</sup>, [David H. PASHLEY](#)<sup>2)</sup> and [Takeshi ENDO](#)<sup>4)5)</sup>

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**Abstract:**

The aims of this study were to synthesize new phosphonic acid monomers, and to examine their bonding performance. Four kinds of newly designed phosphonic acid monomers were synthesized, and seven experimental composite-type adhesive resins comprising the synthesized monomers (3 wt%), with BPO/ DEPT/ BPBA initiator were prepared. Tensile bond strengths of the adhesive resins to enamel and metal were measured with a universal testing machine at a crosshead speed of 1.0 mm/ min. The synthesized adhesive monomers were light yellow viscous liquids with 32.5%-49.3% yields, and identified by <sup>1</sup>H NMR, IR and elemental analysis to be (meth)acryloxyalkyl 3-phosphonopropionates [R-P(=O)(OH)<sub>2</sub>] (5-MPPP, 6-MHPP, 6-AHPP, 10-MDPP). It was found that the newly developed phosphonic acid monomers with BPO/ DEPT/ BPBA initiator attained strong adhesion to both unetched, ground enamel and sandblasted Ni-Cr alloy with good durability. They

exhibited significantly higher bond strengths than conventional phosphorous-containing monomers such as MEPP and VBPA ( $p < 0.01$ ). These findings indicate that the experimental phosphonic acid monomer-containing adhesive resins have potential prosthodontic and orthodontic applications, especially as self-etching, non-rinsing orthodontic adhesive resins.

**Key words:**

[phosphonic acid monomer](#), [polymerization initiator](#), [adhesive resin](#)



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