ヒドロキシピリジル基を含有する光接着材料の作製および評価

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Fabrication and characterization of photo-adhesive materials containing hydroxypyridyl groups

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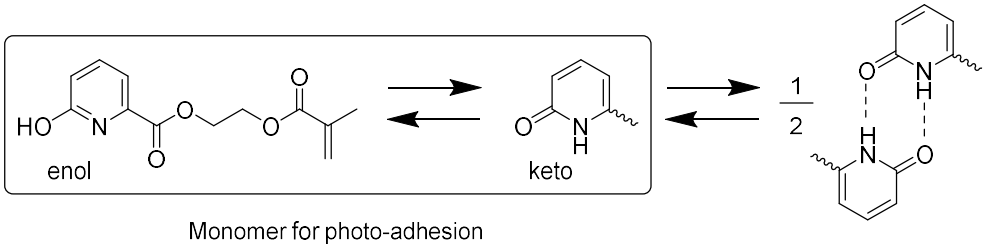
It is known that hydroxypyridines change their polarity as well as molecular structures through keto-enol tautomerization reactions. In this work, introduction of 6-hydroxypyridyl group into a methacrylic monomer was attempted, and a photo-adhesive material utilizing chemical property of the functional group was fabricated. The photo-adhesive methacrylic monomer was synthesized as a white solid in a 1.3% yield, using 6-hydroxy-2-pyridinecarboxylic acid and 2-hydroxyethyl methacrylate (HEMA) as starting compounds. The synthesized monomer was mixed with HEMA, a radical photo-initiator, and a minimum amount of THF. Polymer, metal and zirconia substrates were used for adherends. Photo-adhesion of these dissimilar materials with glass substrates was performed, based on radical UV curing reactions. In all cases of glass-glass photo-adhesive samples, material failure was observed. Average shear stress of the glass-copper photo-adhesive samples was 5.4 MPa. The XPS spectra of each adhesive layer residue of the sample suggested that 6-hydroxypyridyl group would have different molecular states between the glass- and copper-side residues.

Keywords : Hydroxypyridyl Group; Tautomerization Reaction; Photo-adhesive Methacrylic Monomer; Radical UV Curing; Dissimilar Material

ヒドロキシピリジンは，ケト-エノール互変異性化反応に伴い分子構造とともにその極性を変化させることが知られている。本研究では、6-ヒドロキシピリジル基のメタクリルモノマーへの導入を試み、同官能基の化学特性を活用した光接着材料の作製を目指した。6-ヒドロキシ-2-ピリジンカルボン酸と 2-ヒドロキシエチルメタクリラート（HEMA）を主原料とし、目的のモノマーを白色固体として収率 1.3%で合成した。 同モノマーと HEMA、光ラジカル開始剤、必要最少量の THF を用いて光接着材料を調製した。被着体としてポリマー、金属およびジルコニアの各基板を用意し、ラジカル UV 硬化に基づいてガラス基板との異種材光接着を試みた。ガラス-ガラス光接着試料は全て材料破壊となり、ガラス-銅光接着試料での平均剪断応力は 5.4 MPa とやや高強度であった。ガラス-銅光接着試料破断後の接着層残渣の XPS スペクトルを測定したところ、基板ごとに異なる分子状態であることが示唆された。



Monomer for photo-adhesion

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