

TETRAKIS(2,4,6-TRIMETHYLBENZOYL)SILANE AS PHOTOINITIATOR IN VISIBLE LIGHT DENTAL CURING

Moritz Mitterbauer^{a,b}, Michael Haas^c, Harald Stüger^c, Norbert Moszner^{b,d}
and Robert Liska^{a,b,*}

^a Institute of Applied Synthetic Chemistry, Technische Universität Wien,
Getreidemarkt 9, 1060 Vienna, Austria

^b Christian Doppler Research Association, Boltzmanngasse 20, 1090 Vienna, Austria

^c Institute for Inorganic Chemistry, Graz University of Technology, Stremayrgasse 9/V,
8010 Graz, Austria

^d Ivoclar Vivadent AG, Bendererstraße 2, 9494 Schaan, Liechtenstein

*robert.liska@tuwien.ac.at

The curing of dental filling materials is one out of several modern applications (e.g. lithography- based ceramic manufacturing[1]) for visible light photopolymerization. The widely used Norrish Type II photoinitiating system based on camphorquinone / dimethylamino benzoic acid ethyl ester (CQ/DMAB) shows quite limited reactivity and other photoinitiators like bisacylphosphine oxides (BAPO), which generally show more effective cleavage are limited by their absorption band for which the overlap with the emission band of the applied dental LEDs is rather poor. Diacylgermane-based structures like diethyldi(4-methoxybenzoyl)germane show a significant bathochromic shift however they also revealed drawbacks concerning its high production costs.

Since photoinitiators based on silicon might exhibit similar absorption properties as their germanium analogues, the synthesis and photochemical characterization of such a compound was the target of this study. Novel concepts should be explored due to the rather low stability of the existing acylsilane-based Type I systems. Moreover, an improvement in reactivity should be achieved by repressing the photoinduced siloxycarbene formation (Brook-rearrangement).

The strategy of multiple substitution at the silicon atom with aromatic acyl groups was envisaged and resulted in a successful synthesis of tetrakis(2,4,6-trimethylbenzoyl)silane[2]. The absorption band of this compound overlaps well with the emission band of dental LEDs and high photoreactivity could be demonstrated by photopolymerization of acrylates. However, strategies for preventing undesired aqueous hydrolysis by increasing the stability still need to be established.

[1] Schwentenwein, M.; Homa, J. *Int. J. Appl. Ceram. Technol.* **2015**, 12, (1), 1-7.

[2] Mitterbauer, M.; Haas, M.; Stueger, H.; Moszner, N.; Liska, R. *Macromol. Mater. Eng.* **2017**, 302, (5), n/a.