Tetraacylgermanes: Highly Efficient Photoinitiators for Visible-Light Induced Free-Radical Polymerization

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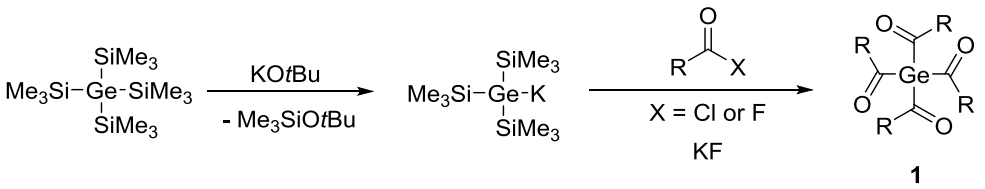
In this talk a convenient synthetic method to obtain tetraacylgermanes **1** $Ge[(CO)R]_4$ (R = Aryl), a previously unknown class of highly efficient Ge-based photoinitiators, is described. This robust one-pot reaction protocol enables a versatile introduction of organic residues R, tailored to meet the requirements needed (see Scheme 1). Moreover, they offer the advantages of significantly red-shifted absorption bands and reduced toxicity compared to the frequently applied phosphorus-based PIs.[1] State-of-the-art Ge-based photoinitiators, such as bis(4-methoxybenzoyl)diethylgermane (Ivocerin®),[2] still suffer from inefficient curing depth at wavelengths > 500 nm and lack of a facile preparation, as its synthesis relies on a Corey-Seebach reaction.[3] Thus, it is highly desirable to replace the multi-step synthesis of Ivocerin® by simplified synthetic approaches.



Scheme 1. One-pot synthesis of tetraacylgermanes **1**.

Their performance as photoinitiators is demonstrated in photobleaching (UV-Vis), time-resolved EPR (CIDEP) and NMR/CIDNP investigations as well as by photo-DSC studies. **1** exceed the performance of currently known long-wavelength visible-light photoinitiators for free-radical polymerization. They show fast photobleaching, even upon irradiation with high wavelength visible light, which demonstrates their superior potential as highly efficient photoinitiators for free radical polymerization, especially for the use in dental filling materials.

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References:

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