

# GROUP TRANSFER POLYMERIZATION FOR USE IN DENTAL APPLICATIONS

Florian Pieringer<sup>a</sup>, Yohann Catel<sup>b</sup>, Robert Liska<sup>a</sup>, Norbert Moszner<sup>b</sup>, Patrick Knaack<sup>a</sup>

<sup>a</sup>Institute of Applied Synthetic Chemistry, TU-Wien, Vienna, Austria

<sup>b</sup>Ivoclar Vivadent AG, Schaan, Liechtenstein

Group Transfer Polymerization (GTP) was first discovered in the 1980s by DuPont and used to synthesize acrylic block copolymers in solution at moderate temperatures. It is a living polymerization technique using mainly 1-methoxy-1-(trimethylsiloxy)-2-methylprop-1-ene (MTS) as the initiator in combination with different catalysts like Brønsted acids [1]. The controlled polymerization mechanism leads, when used with difunctional monomers in bulk, to very homogeneous networks with improved mechanical properties. These improved properties lead to various possible applications in photopolymerizable systems for dental materials.

The aim of this work was to implement the usually solvent based GTP into common methacrylic bulk systems used in dental materials. In order to get an overview over the properties of different catalysts, a selection of literature known catalysts was used in experiments with different monomer systems. An iodonium aluminate salt, which is commonly used for cationic photopolymerization, and trityl tetrakis(pentafluorophenyl)borate showed remarkably high reactivity upon irradiation with UV-light when utilized as GTP catalyst.

In various experiments the influence of moisture and protic groups were investigated. Furthermore, specimens of non-protic monomers were prepared, to compare the mechanical properties of UV-GTP polymerized materials with radically polymerized samples.

---

[1] Webster, O. W., The discovery and commercialization of group transfer polymerization. *Journal of Polymer Science Part A: Polymer Chemistry* 2000, 38, 2855-2860.