LED Catalyst:

New photoredox catalyst and method for UV-LED polymerization

- **New catalytic system based on a copper complex capable of efficient photopolymerization under mild LED light intensity activation**
- **Replacing classical photoinitiator by an efficient photocatalyst**

KEYWORDS

- Photopolymerization
- Photocatalysis
- Acrylates and epoxies polymerization
- Hybrid system (interpenetrating polymer network)
- Composites
- UV-LED

PATENTS

- **WO2015132295**
  Filled on: March 4th, 2015
- **EP19305017.6**
  Filled on: January 7th, 2019

INVENTORS

- Jacques Lalevée
  IS2M Mulhouse
  CNRS-UHA UMR 7361

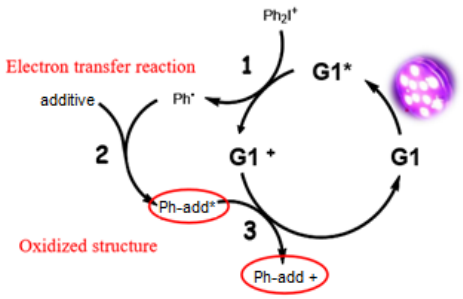
TECHNO-STATUS

☐ **Proof of concept achieved**
255 000 euros of Conectus investment for proof of concept

☐ **Ready to market:**
open for licensing

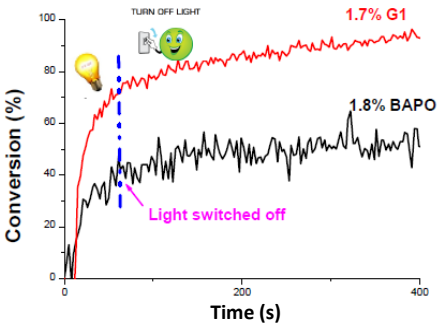
TECHNOLOGY

- The technology is able to perform photopolymerization of acrylate and epoxy resins thanks to an unique photoredox catalytic cycle



- The catalytic cycle is composed of 3 reactive species:
  - **G1**, a copper complex generating the radical specie in combination with
  - a commercially available iodonium salt (**PhI+**) as an oxidation agent,
  - an **additive**, which **regenerates G1**

- The versatility of the system has been demonstrated either for **free radical or cationic photopolymerization**.
- The catalytic cycle allows extensive polymerization **at low G1 concentration (>0.05 wt%) and low iodonium content (≈1 wt%).**
- Interpenetrating Polymer Network (IPNs) can be formed in a one-step hybrid curing process using the G1-based system, in air and in laminate conditions upon the LED@405 nm



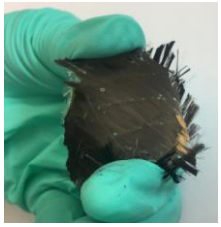
Photopolymerization profiles of an epoxy resin under air in the presence of G1 or BAPO upon LED @405nm.
The remaining activity of the G1 system when light is turned off affords better cured materials and is a major advantage for the polymerization of thick samples.

INNOVATION ADVANTAGES

- Initiation of the polymerization with safer (longer) wavelengths (use of LED light @405 nm)
- Excellent conversion with low amount of photocatalyst which is regenerated during the reaction
- Thin (25 µm) or thick (1.4 mm) to filled and pigmented materials can be cured by the technology
- No sensitivity towards water
- Efficient alternative to current solutions, versatility (free radical or cationic polymerization)
- Increased performances, consumption savings and safety
- Excellent stability upon storage
- No photoredox catalyst on the market yet

APPLICATIONS

- Adhesives
- Coatings
- Inks
- Impregnated or filled materials, such as composites (e.g. **glass or carbon fibers**)



Carbon fibers fully cured after one pass

DEVELOPMENT STATUS

- Proof of concept of the technology has been achieved
- TRL 6

CONTACT I Lucie SCHIAVO ● Project leader ● lucie.schiavo@satt.conectus.fr ● +33 (0)6 03 49 20 99

CONECTUS ● Parc d'innovation ● 650 bld Gonthier d'Andernach
67400 ILLKIRCH ● France ● Tel. +33 (0)3 68 41 12 60
www.conectus.fr