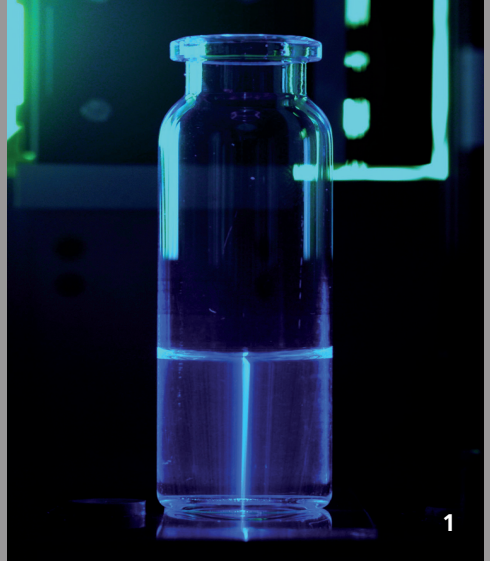
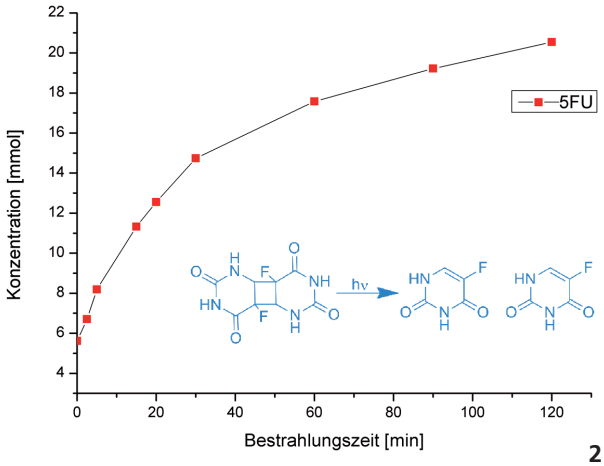


1




2



# LASER-INDUCED DRUG RELEASE FOR TUMOR TREATMENT

## Task

Controlled drug release from implants is currently being intensely studied in the fields of drug delivery and tissue engineering. The development of innovative medical devices equipped with an intelligent release system for temporal and spatial drug delivery is a new therapeutic approach in numerous medicinal fields. With help of such intelligent medical devices, therapies with adapted medication could become available, thereby minimizing negative side effects for the patients.

## Method

To implement this approach, a research project within the Excellence Initiative of RWTH Aachen University investigated controlled drug release based on special photo chemically addressable micro gels; these gels were triggered via laser light to control drug release temporally and spatially. Proof of concept and feasibility of this therapeutic approach could be demonstrated for tumor reduction in the gastrointestinal tract. The light-controlled drug supply is based on a scaffold made from polymer fibers containing drug-loaded micro gel capsules. The chemotherapeutic agent 5-Fluorouracil (5FU) is selectively released by means of laser irradiation.

*1+2 Photo cleavage for 5FU drug release.*

## Result

The drug 5FU was converted into the corresponding dimer via [2+2] cycloaddition reaction and coupled onto a cyclodextrin (CD-) micro gel. This CD-micro gel was mixed with a polymer solution and spun into drug-loaded polymeric fibers. Photo chemical cleavage of 5FU from the micro gel support is performed with UV radiation of 254 -266 nm in wavelength.
The targeted photo cleavage products were detected by high pressure liquid chromatography (HPLC). The polymeric drug release system developed here was tested in cell culture experiment and proved to be non-cytotoxic. Further investigations are ongoing to prove that activity and concentration of the released drug is sufficient to prevent tumor cell lines from growing.

## Applications

In biomedical engineering there is a trend for coaction of medical devices and pharmaceutical agents. In established products, active control mechanisms for drug release are missing; our approach promises to fill this gap. Besides being a more effective and gentler treatment of tumors, such local therapies can be applied for wound treatment via controlled release of anti-inflammatory drugs as well as in regenerative medicine for triggered release of growth factors to selectively induce tissue formation.

## Contacts

Dr. Elke Bremus-Köbberling
Phone +49 241 8906-396
elke.bremus@ilt.fraunhofer.de

Dr. Arnold Gillner
Phone +49 241 8906-148
arnold.gillner@ilt.fraunhofer.de

*Project partners*

- *Funktionale und Interaktive Polymere, RWTH Aachen (FIP)*
- *Lehrstuhl für Textiltechnik, RWTH Aachen (ITA)*
- *Klinik für Allgemein-, Viszeral- und Transplantationschirurgie, Universitätsklinikum der RWTH Aachen (UKA)*



Fraunhofer Institute for Laser Technology ILT, www.ilt.fraunhofer.de
DQS certified by DIN EN ISO 9001, Reg.-No.: DE-69572-01