



Sonderforschungsbereich 595

Elektrische Ermüdung  
in Funktionswerkstoffen



TECHNISCHE  
UNIVERSITÄT  
DARMSTADT



## SFB 595 Kolloquium in cooperation with GRK 1037

05. Juli 2007, 16.15 Uhr

Gebäude der  
Materialwissenschaften

Raum 77

**ORMOCER<sup>®</sup>s - Class-II Sol-Gel hybrids: Synthesis and application in optical, electrical and o/e interconnection technology and packaging as well as in microoptics and photonics.**

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Photopatternable hybrid inorganic-organic polymers, ORMOCER<sup>®</sup>s, with negative resist behaviour have been developed and tested for microoptics, dielectrics and opto/electrical interconnection technology. They are composed of inorganic oxidic structures cross-linked or substituted by organic groups. The synthesis starts from organosilane precursors reacted by sol-gel-processing in combination with organic crosslinking of polymerizable organic functions. As a result of these functionalities the properties of the ORMOCER<sup>®</sup>s are adjusted to the particular applications. Systematic variation of composition and structure of the inorganic part (e.g. by Nano-Building-Blocks) combined with adaptation to micro/nano system technology allows great flexibility in processing. The main features of these materials are:

- Combined use as dielectric and passivation layers in electrical systems and devices as well as core and cladding for optical applications enables o/e applications with high integration level.
- Postbaking at moderate temperatures (100 °C - 170 °C) enables processing on low-cost substrates such as FR-4 for high density integrated circuit boards and even on PET foils, opening the use in polymer electronic applications.
- Easily adaptable to thin film technology: spin-on with very good planarization (rms < 1nm), via diameters of 15 µm layers down to < 20 µm and high aspect ratio for optical waveguides have been achieved.
- Newly developed combined lithography and UV-embossing (soft lithography) and nano-imprint technology based on ORMOCER<sup>®</sup>s enable wafer-scale production of nanostructures like diffractive and refractive optics, dielectrics, as well as one-step processes for e.g. waveguides including nano-sized coupling-gratings etc..
- Newly developed femtosecond laser-induced two-photon polymerisation based on ORMOCER<sup>®</sup>s lead to first test-objects for set-up of photonic crystals, 3-D optical couplers and in general 3-D nano- and micro-patterned objects.

This talk will give an overview of the nano-micro-world of ORMOCER<sup>®</sup>s including recent developments. One focus will be to demonstrate the benefits of using chemical design for easy tuning of the nanoscaled materials towards the needs of micro-nano-technology and process optimisation.

Several applications of those hybrid materials finally will be given.