

UV-INDUCED THIOL-ENE CLICK-REACTIONS FOR THE COVALENT ATTACHMENT OF NANOPARTICLES TO POLYMER MATRICES

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Nanodielectrics are materials that commonly consist of a polymer matrix, in which inorganic nanofillers are embedded [1]. Due to the compounding of nanoparticles to the polymer matrix, the dielectric properties of the material are altered. In this study, the effect of the covalent attachment of silica particles into the polymer matrix was investigated: In the course of the reaction with mercapto-bearing silane coupling agents, the particles' surfaces were equipped with thiol groups. Subsequently, the mercapto-functionalized particles were covalently attached to (unsaturated) polysiloxanes and poly(2-oxazoline)s (Figure 1) as well as epoxy/amine resins (upon the addition of the co-reactant allylamine) by UV-induced thiol-ene click reactions.

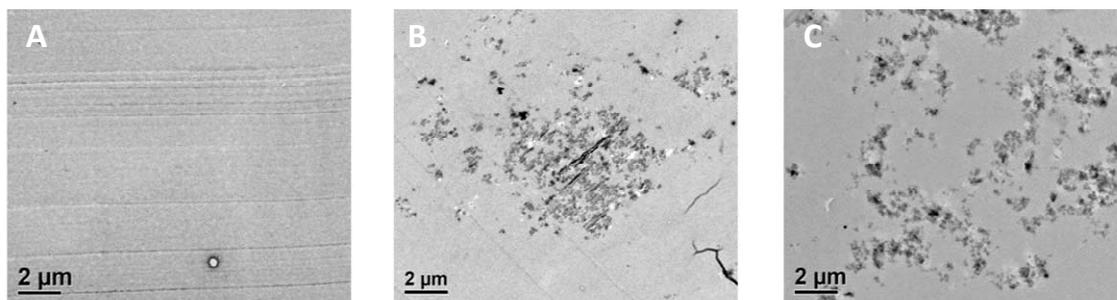


Figure 1: TEM images of the copoly(2-oxazoline) composed of repetition units of 2-nonyl-2-oxazoline and 2-dec-9'-enyl-2-oxazoline. (A) Unfilled. (B) Filled with non-functionalized silica. (C) Filled with mercapto-functionalized silica.

Due to the covalent embedment of the silica nanoparticles, aggregation of the particles could be suppressed to significant extent. By dielectric spectroscopy, it was found that the covalent embedment of the silica particles yielded materials with lower loss factors than those of the materials with non-functionalized silica particles.

[1] P. Marx, A.J. Wanner, Z. Zhang, H. Jin, I.-A. Tsekmes, J.J. Smit, W. Kern, F. Wiesbrock, *Polymers* **2017**, *9*, 195:1-195:16.