PhD thesis abstract

Photocurable urethane acrylate varnishes – preparation and evaluation of properties

mgr inż. Paulina Bednarczyk

supervisor: dr hab. inż. Agnieszka Kowalczyk, prof. ZUT

The research concerns the use of a wide spectrum of commercially available urethane acrylate oligomers with different physicochemical properties in order to obtain varnishes cured by free-radical photopolymerization using low intensity radiation (UV or UV-LED). As a rule, the obtained varnishes, potentially used as protective and decorative coatings, should be characterized by: (i) short curing time without the effect of oxygen inhibition using a source of low intensity radiation; and (ii) the balanced properties of cured coatings (hardness and flexibility, high gloss, adhesion and low yellowness). Within dissertation, the impact of functionality, viscosity, structure of the carbon chain, and the presence of additional functional groups of the tested urethane acrylate oligomers were determined. The influence of the type and concentration of the photoinitiator and the chemical modification of the varnish composition on the photocuring process and the properties of the cured coatings were also investigated. To reduce the effect of oxygen inhibition, modifiers with functional groups such as thiol, amine and ethers were used.

The first part of the doctoral dissertation concerns a review of the literature, which presents the most important issues related to the photopolymerization of (meth)acrylates, preparation, modification and characterization of urethane acrylates and the technology of photocurable varnishes.

In the second part, the materials and the used research methods are characterized and then the obtained results and their discussion were presented. In the last part of the work, conclusions were formulated regarding the influence of the physicochemical properties of urethane acrylate oligomers, their chemical modification and methods of photocuring on the curing process and the mechanical and optical properties of the obtained coatings.

Paulina Bednarczyk

Szczecin, 2.12.2020 r.