

West Pomeranian University of Technology Szczecin

Faculty of Chemical Technology and Engineering

PhD Student: **MSc Ewelina Minciel**

The subject of the doctoral dissertation: **Development of manufacturing technology of transfer (carrier-free) adhesive tapes with a thickness of 1 millimeter**

Tutor of the PhD: prof. dr hab. inż. Zbigniew Czech

Abstract

The aim of the doctoral thesis was to develop a technology for the production of pressure-sensitive adhesives films with a thickness of 1 mm on the basis of polyacrylate solvent-free, low-viscosity (LVS) of pressure-sensitive adhesives, coated at room temperature. The final product, obtained after photocrosslinking and photopolymerization with ultraviolet (UV) radiation, has a form of the transfer (carrier-free) adhesive tapes. The main directions of its application are the automotive, aerospace, construction, furniture and medical industries.

The first stage of the doctoral thesis was the preparation of the adhesive composition using a hot-melt adhesive Micryl 250 from PolyChem Comany (Germany). Reduction of the viscosity of the composition was carried out by adding the photoreactive urethane-acrylate diluent Genomer 1122 in ratios of 1:1, 1:1.1, 1:1.2, 1:1.3, 1:1.5, 1:2, 1:2.5 and 1:3. Then to each pressure-sensitive composition were added, 1, 2, 3 and 5% by weight of the selected multifunctional monomer specified in the table in the experimental part of the doctoral dissertation. The next step was the addition of a photoinitiator selected from the list of photoinitiators detailed in that dissertation.

The next stage concerned the use of an additional AlACA (aluminum acetylacetonate) cross-linking compound and the selection of its optimal concentration. The concentration in individual compositions was 0.3, 0.5, 0.7 and 1% by weight of aluminum acetylacetonate relative to the weight of the adhesive. After analyzing the test results to which the samples were subjected, the concentration of 1% by weight of AlACA was chosen as the most advantageous.

The next stage consisted in adding hollow glass microspheres (HGS) with the addition of 0.5% by weight of HDDA to the selected composition. The amounts used in the individual compositions were 5.0 and 7.5 and 10 by weight of HGS. After analyzing the test results to which the samples were subjected, the HGS concentration of 5% by weight was chosen as the most advantageous.

The last stage consisted in coating and crosslinking with UV radiation of each sample in the form of 1mm thick pressure-sensitive adhesive films. The adhesion, cohesion, tack and organoleptic properties of the self-adhesive adhesive films obtained were examined.

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