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OPTIMIZATION OF DOUBLE-BOND CONVERSION OF ACRYLIC UV-CURABLE RESIN FORMULATIONS

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Acrylic UV-curable resins offer a wide range of application from car varnishes and glues to dental materials. There occur two major drawbacks, using acrylic resins: On the one hand a residue of acrylic groups may cause contact allergies and skin rashes, and on the other hand the acrylic resins are irradiated without the presence of inert gas, so that aerial oxygen inhibits the crosslink reaction of resin films. The aim was to optimize the crosslink reactions to achieve a high conversion of the acrylic groups in the presence of air. Therefore a number of resin formulations comprising acrylic resin, reactive diluents and a photo initiator were mixed and irradiated with miscellaneous UV-light intensities using a conveyor belt irradiation device for industrial applications. The rate of double bond conversion was determined via FTIR-Spectroscopy, using the decrease of the C=C double bond absorption band (1640 and 813 cm^{-1}) as index for double bond conversion. The area of the absorption bands was compared for different resins and irradiation intensities, to determine the resin compositions having reaction kinetics in an optimum way. Later on silica particles were added to the resin compositions and the influences on reaction kinetics were determined using the method mentioned before.