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SYNTHESIS AND KINETICS OF POLYURETHANE POLYMERS AND DISPERSIONS AND THEIR APPLICATIONS

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Aqueous polyurethane dispersions (PUDs) are virtually prepared from prepolymers having ionic and/or nonionic compositions. The majority of PUDs produced commercially (~95%) are from the prepolymers having an ionic backbone, which is attained by incorporating a molecule capable of bearing ionic (anionic or cationic) charge. Dimethylolpropionic acid (DMPA) is the most commonly used material to incorporate internal ionic moiety for the preparation of anionic prepolymers. The chemistry of preparing ionic prepolymers is often complex and requires a fundamental understanding of the process. Several papers were published on the preparation of the PUDs but no report was on found describing the details the prepolymer synthesis.

PUDs based on prepolymers capable of bearing ionic moieties have been produced for variety of applications. Therefore, effects of various parameters on the kinetics and process of preparing ionic prepolymers were investigated. The kinetics of the prepolymer synthesis with emphasis on the disappearance of the acid groups (COOH) was investigated. Te role of the carboxylic acid on the reactions between isocyanate and polyols were studied in the presence of various variables and conditions. The effects of the solvent type and amount, prepolymer composition (high & low hard segment content), presence of different tertiary amines having different pKa values (triethyl amine, N-methyl morpholine), types of isocyanate, types of ionic molecules (DMPA, DICAP 600) and their concentrations on reaction kinetics and storage stability of prepolymers were studied. The findings enabled the preparation of anionic prepolymers and submicron size and solvent-free PUDs used for variety of applications.