

CHARACTERISATION AND USE OF ALKENE OZONATES AS INITIATORS OF SOLUTION AND EMULSION POLYMERISATIONS

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Abstract

The ozonolysis of alkenes yields a range of products: epoxides, ozonides, cyclic diperoxides, cyclic triperoxides and linear or cyclic oligomeric structures, collectively referred to as 'ozonates'. The nature and position of substitution around the alkene double bond, the solvent used, and temperature of the ozonolysis reaction all affect the distribution of the products. A range of small alkenes, including tetramethylethylene (TME), were ozonised in a range of solvents at different temperatures, and the products were characterised by NMR spectroscopy. An appreciation of the distribution of the oligomeric products of alkene ozonolysis can be obtained using electrospray MS under soft conditions. Alkene ozonates have been used to initiate emulsion polymerisations of styrene and methyl methacrylate. The addition of a reductant, such as ascorbic acid, aids initiation in emulsion polymerisations of butyl acrylate and vinyl acetate. Also, the ozonate mixtures of TME have initiated solution polymerisations of styrene, methyl methacrylate, vinyl acetate and N-vinyl pyrrolidinone. The ozonolysis of macromolecular alkenes was explored with the aim of thermolysing the resulting ozonates to give macroradicals which in turn could be used in further polymerisations to create block and graft copolymers. A commercial grade polyisobutylene with terminal alkene end groups was ozonised and then heated in the presence of styrene and methyl methacrylate, with new polymer being formed. Gradient polymer elution chromatographic (GPEC) analysis showed that in the case of styrene, block copolymer was indeed produced.

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