

The polymerization is carried out in the presence of an accelerator (sometimes also called a co-catalyst). ~~Suitable~~ accelerators are carboxylic anhydrides, acyl halides and carboxylic acids whose pKa is less than about 6 in water.

By a carboxylic anhydride is meant a compound containing the grouping $-C(O)O(O)C-$, wherein the free valencies are to other carbon atoms. A preferred carboxylic anhydride is an anhydride of an alkyl carboxylic acid or a halogen substituted alkyl carboxylic acid, and particularly preferred anhydrides are acetic anhydride and trifluoroacetic anhydride.

By an acyl halide is meant a compound containing the grouping $-C(O)X$, where X is chlorine or bromine and the free valence is to another carbon atom. In preferred acyl halides X is chlorine. Preferred acyl halides are alkyl acyl halides, and especially preferred are acetyl halides, more preferably acetyl chloride.

By a carboxylic acid is meant a compound containing the grouping $-C(O)OH$, wherein the free valence is to another carbon atom. Preferred carboxylic acids have a pKa of less than 5 in water. Useful carboxylic acids include, but are not limited to formic, acetic, trifluoroacetic, chloroacetic, benzoic, trichloroacetic, p-nitrobenzoic, butyric, and naphthoic acids. Preferred carboxylic acids are trifluoroacetic, formic, acetic, cyanoacetic, nitropropionic, nitrobenzoic, acrylic and methacrylic. These and other acids that themselves don't cause polymerization of the cyclic ethers are also believed to be accelerators, especially if their pKa in water is about 6 or less.

When carboxylic anhydride is present one half or more of the end groups are carboxylic esters. As is known to the artisan, these may be hydrolyzed to hydroxyl groups by reaction with water, preferably in

Both types of catalysts used herein contain selected metal cations. ^{the} ~~Preferred~~ metal cations are those of strontium, scandium, yttrium, the rare earth metals, titanium, zirconium, hafnium, vanadium, niobium, tantalum, chromium, molybdenum, tungsten, rhenium, iron, ruthenium, palladium, copper, gold, zinc, tin and bismuth. More preferred metals are yttrium, the rare earth metals, scandium and zirconium. Especially preferred metals are yttrium, ytterbium, dysprosium, erbium, neodymium, lanthanum, scandium and zirconium. Another preferred metal is "mischmetall" (sometimes also called "didymium"), which is a mixture of rare earth metals as obtained from the ore. By rare earths herein is meant lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, and lutetium. By a perfluoroalkylsulfonate herein is meant a metal salt of a perfluoroalkylsulfonate in which the metal is bonded to one or more perfluoroalkylsulfonate groups.

One of the catalysts used herein is a zeolite in which some of the metal cations present are the cations listed above. The anions of such cations are not critical, and may be those normally found in zeolites. The zeolites containing the appropriate metal cations can be made by the ion exchange of cations in known zeolites. Such ion exchange processes are known to the artisan, see for instance D. W. Breck in Zeolite Molecular Sieves, R.E. Krieger Publishing Co., Malabar, Florida, 1984 and Examples 7, 9, 12, 14, 16, 18, and 20. It is preferred if at least 0.5 atom percent of the metals and metalloids in the zeolite are one of the useful "catalytic" metals, more preferably at least 5 atom percent. It has been found that the zeolite

17. The process as recited in Claim 10 wherein said accelerator is a carboxylic acid whose pKa in water is about 6 or less.

18. The process as recited in Claim 10 wherein said heterogeneous catalyst ^{is supported on} ~~support is~~ alumina, silica, silica-aluminate, carbon or zirconia.

19. A process for the depolymerization of a polyether to a tetrahydrofuran, comprising, contacting at a temperature of ~~about~~ 100°C to ~~about~~ 250°C, a polymer consisting essentially of one or more repeat units of the formula



wherein each R¹, R², R³ and R⁴ is independently hydrogen or hydrocarbyl containing 1 to 20 carbon atoms, with a heterogeneous catalyst containing a metal perfluoro-alkylsulfonate attached to the surface of said catalyst, said metal selected from the group consisting of strontium, barium, scandium, yttrium, the rare earth metals, titanium, zirconium, hafnium, chromium, molybdenum, tantalum, rhenium, iron, ruthenium, osmium, rhodium, iridium, palladium, platinum, silver, gold, zinc, cadmium, mercury, aluminum, gallium, indium, thulium, germanium, tin, lead, arsenic, antimony and bismuth.

20. The process as recited in Claim 19 wherein R¹, one of R², both of R³ and R⁴ are hydrogen, and the remaining R² is alkyl containing 1-4 carbon atoms.

21. The process as recited in Claim 19 wherein said metal cation is strontium, scandium yttrium, the rare earth metals, titanium, zirconium, hafnium, vanadium, niobium, tantalum, chromium, molybdenum, tungsten, rhenium, iron, ruthenium, palladium, copper, gold, zinc, tin or bismuth.

22. The process as recited in Claim 19 wherein all of R¹, R², R³ and R⁴ are hydrogen.

23. The process as recited in Claim 19 wherein said heterogeneous catalyst ^{is supported on} ~~support is~~ alumina, silica,
5 silica-aluminate, carbon or zirconia.