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PATENT APPLICATION

PROCESS FOR THE MANUFACTURE OF CONDENSATION PRODUCTS

It has been found that condensation products of olefins with formaldehyde can be made in very good yields if the reaction is carried out in the presence of a cation exchanger on synthetic resin basis.

The reaction can be carried out with olefins and diolefins, especially with those which have a tertiary carbon atom or those in which the double bond is activated by substituents, e. g., isobutylene, 2, 5-dimethylhexadiene-1,5, 1, 1, 4, 4-tetramethylbutadiene, 2, 3-dimethylbutadiene, methallylchloride, styrene, anethol or isosafrol. Compounds which give off formaldehyde can be used instead of formaldehyde itself. The reaction is advantageously carried out in the presence of solvents or diluents like water or aliphatic or aromatic hydrocarbons at temperatures between -10 and 130°C. The reaction can be carried out at atmospheric or elevated pressure. The optimal experimental conditions must be determined in small-scale tests and depend on the kind of olefinic compounds reacted.

The process can be carried out batchwise or continuously. In the first case the process is carried out in such a way that the compounds to be reacted are stirred with the ion exchanger, either in the form of lumps or powder. Stirring is continued, if necessary, under heating until the reaction has been completed. In the continuous process the compounds to be reacted are passed through a tower which is packed with the ion exchanger. The condensation product separates, usually, in the form of an oil from the non-reacted starting material.

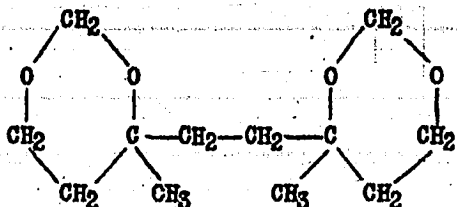
The new process has the advantage that the reaction products are not only obtained in good yields but also without acidic by-products. The condensation products obtained in this way contain up to 30% oxygen which is present in the form of an ether. Hydroxy, carbonyl and carboxylic groups cannot be detected in the reaction product unless they have been present in the olefinic starting material. The products which are probably methylene ethers or dioxane derivatives are mostly light-colored oils which can be distilled, if necessary, under reduced pressure. They can be used as solvents or plasticizers for synthetic resins or as intermediates.

Example 1.

208 kilograms of styrene, 320 kilograms of paraformaldehyde, 600 liters of water and 500 liters of an ion exchanger containing an omega sulphonic acid group (as used in water purification) are heated for 6 - 8 hours under stirring and refluxing. The catalyst is then separated from the cooled reaction mixture and the oily liquid is distilled under vacuum. 260 kilograms of the clear oil is distilled over until a temperature of about 130° is reached at 15 mm. pressure; this corresponds to a yield of 39.8%. The residue amounts to about 16 kilograms. The main fraction contains 72.6% carbon and 7.57% hydrogen and is 4-phenyl-1,3-dioxane.

### Example 2.

165 kilograms of 2,5-dimethylhexane-1,5, 1,000 kilograms of 40% aqueous formaldehyde solution and 300 liters of the ion exchanger mentioned in Example 1 are heated with steam for 5 hours before stirring. The cooled reaction mixture is extracted with ether after separation from the catalyst. The residue remaining after the distillation of the ether amounts to 292 kilograms which is 81.4% of the amount calculated. It contains 63.22% carbon and 9.67% hydrogen. It probably has the following structure



### Example 3.

174 kilograms of isobutylene, 500 liters of a 40% aqueous formaldehyde solution and 200 liters of the previously-mentioned catalyst are heated for 24 hours in an autoclave at 70°C. and at 20 atmospheres pressure. The reaction product is worked up as under Example 1. 4,4-dimethyl-1,3-dioxane of a boiling range of 130 - 135°C. at 760 mm. pressure is obtained in good yield.

### Claims.

Process for the manufacture of condensation products from olefinic compounds and formaldehyde characterized by carrying out the condensation in the presence of ion exchangers on synthetic resin basis.