Claims

1. Process for the production of alkoxylates by reacting at least one monomeric educt in the presence of an alkaline catalyst and at least one starting material in at least one first reactor (11) and thereafter passing the product of the first reactor (11) to at least one second reactor (22) for further reaction, wherein~~characterized in that~~ the first reactor (11)~~,~~ is provided with a first external circulation loop (10) comprising a circulation pump and a heat exchange device, and comprises a smaller volume than the second reactor (22), which is provided with a second external circulation loop (25) comprising a circulation pump and a heat exchange device, and is connected to the first reactor (11), and wherein~~that~~ in the first reactor (11) a pre-polymer is produced which thereafter is passed to the second reactor (22), wherein the desired polymer is produced, **characterized in that** the second reactor (22) comprises a volume, which is at least four times the volume of the first reactor (11), wherein at least ~~one of the first or~~ the second reactor (22) is a jet loop reactor comprising a jet device to inject reaction medium and the at least one monomeric educt into the second reactor (22), wherein a growth ratio defined as a final batch volume of the second reactor (22) divided by a~~the~~ minimum initial volume of starting material in the first reactor (11) is at least 80 : 1~~,~~ ~~preferably at least 90 : 1, more preferably at least 100 : 1~~.

~~2. Process according to claim 1, **characterized in that** the at least one second reactor (22) comprises a volume, which is more than twice, preferably at least four times the volume of the at least one first smaller reactor (11).~~

~~3.~~2. Process according to claim 1~~2~~, **characterized in that** the at least one second reactor (22) comprises a volume, which is at least six times, preferably at least eight times the volume of the at least one first smaller reactor (11).

~~4.~~3. Process according to claim 2~~3~~, **characterized in that** the at least one second reactor (22) comprises a volume, which is at least nine times, preferably about ten times the volume of the at least one first smaller reactor (11).

~~5.~~4. Process according to one of ~~the foregoing~~ claims 1 to 3, **characterized in that** the first smaller reactor (11) comprises a total reactor volume of less than 10 m³, preferably of less than 8 m³, more preferably of less than 6 m³.

~~6.~~5. Process according to one of ~~the foregoing~~ claims 1 to 4, **characterized in that** the reaction in the first smaller reactor (11) is started with the~~a~~ minimum initial~~starting~~

volume of the starting material corresponding to between a fifth volume part and a twentieth volume part, preferably corresponding to between an eighth volume part and a twelfth volume part, more preferably between a ninth and an eleventh part of the total volume of pre-polymer (23) produced in the first smaller reactor (11).

~~7.~~6. Process according to one of ~~the foregoing~~ claims 1 to 5, **characterized in that** the main part of the volume of pre-polymer produced in the first smaller reactor, preferably essentially the whole volume of pre-polymer (23) produced in the first smaller reactor (11), thereafter is transferred to the second reactor (22).

~~8.~~7. Process according to one of ~~the foregoing~~ claims 1 to 6, **characterized in that** the volume of the pre-polymer (23) produced in the first smaller reactor (11) is between an eighth volume part and a twelfth volume part, preferably between a ninth volume part and an eleventh volume part of the total volume of the polymer produced in the second larger reactor (22).

~~9.~~8. Process according to one of ~~the foregoing~~ claims 1 to 7, **characterized in that** one or more than one monomeric educt is reacted in the first smaller reactor (11) and one or more than one monomeric educt is reacted in the second larger reactor (22), wherein the total mass of educts reacted in the first smaller reactor (11) is between an eighth mass part and a twelfth mass part, preferably between a ninth mass part and an eleventh mass part of the total mass of educts reacted in the second larger reactor (22).

~~10.~~9. Process according to one of ~~the foregoing~~ claims 1 to 8, **characterized in** that in the first smaller reactor (11) at least the following process steps are carried out:
Preheating and mixing the one or more starting materials, adding the catalyst, drying, heating to reaction temperature, adding one or more than one monomeric educt, obtaining a pre-polymer, and thereafter the obtained pre-polymer (23) is transferred to the second larger reactor (22).

~~11.~~10. Process according to one of ~~the foregoing~~ claims 1 to 9, **characterized in that** the growth ratio ~~defined as the final batch volume of the larger reactor (22) divided by the minimum starting volume in the smaller reactor (11)~~ is at least ~~80 : 1, preferably at least~~ 90 : 1, ~~more~~ preferably at least 100 : 1.

~~12.~~11. Process according to one of ~~the foregoing~~ claims 1 to 10, **characterized in that** the starting material (20) is at least one selected from the group comprising alcohols, acids, esters, diols, triols, polyols, amines, amides, monosaccharides, disaccharides, and polysaccharides in particular at least one selected from the group comprising methanol, glycerol, monoethylene glycol, diethylene glycol, monopropylene glycol, dipropylene glycol, trimethylolpropane, ethylene diamine, toluene diamine, sorbitol, mannitol, pentaerythritol, di-pentaerythritol, and sucrose.

~~13.~~12. Process according to one of ~~the foregoing~~ claims 1 to 11, **characterized in that** the one or more than one monomeric educts are drawn from the class of cyclic ethers including but not limited to alkylene oxides, in particular one or more of ethylene oxide, propylene oxide, butylene oxide and tetrahydrofuran.

~~14.~~13. Process according to one of ~~the foregoing~~ claims 1 to 12, **characterized in that** the one or more monomeric educts are dosed to the reaction mass continuously, intermittently, individually, simultaneously in any ratio, consecutively, or in combination thereof.

~~15.~~14. Process according to one of ~~the foregoing~~ claims 1 to 13, **characterized in that** the polymeric product is a polyether polyol or a polyethylene glycol or a polypropylene glycol or a methoxypolyethylene glycol.

~~16.~~15. Process according to one of ~~the foregoing~~ claims 1 to 14, **characterized in that** ~~at least the second larger reactor (22) equipped with the second circulation loop (25) is a jet loop reactor, preferably the larger reactor (22) equipped with the second circulation loop (25) is a jet loop reactor, and~~ the first~~smaller~~ reactor (11) in the first circulation loop (10), wherein the pre-polymer is prepared, also is a jet loop reactor.

~~17.~~16. Plant ~~particularly~~ for carrying out a process for the production of alkoxylates according to one of the foregoing claims, comprising at least one first smaller reactor (11) equipped with a first, smaller external circulation loop (10) comprising at least one pump (13) and at least one heater/cooler (16), and at least one second, larger main reactor (22) equipped with a second, larger external circulation loop (25) and a connection line (21) between the first circulation loop (10) and the second, larger reactor (22) and/or a connection line between the first circulation loop (10) and the second, larger circulation loop (25) comprising at least one pump (26) and at least one heater/cooler (28), wherein~~in which~~ said first smaller reactor (11) comprises a smaller

volume than the second reactor (22), **characterized in that** the second reactor (22) comprises a volume, which is at least four times the volume of the first reactor (11), and said second main circulation loop (25) comprises at least one jet loop reactor as the second reactor (22) which comprises a jet device to inject the reaction medium and the at least one monomeric educt into the second reactor (22), ~~at least one pump (26) and at least one heater/cooler (28) in the second circulation loop (25)~~ wherein the plant is configured for a growth ratio defined as a final batch volume of the second reactor (22) divided by a minimum initial volume of starting material in the first reactor (11) of at least 80 : 1.

~~18.~~17. Plant according to claim 16~~7~~, **characterized in that** the first circulation loop (10) comprises at least one jet loop reactor (11)~~, at least one pump (13) and at least one heater/cooler (16) in the first circulation loop (10)~~.

~~19.~~18. Plant according to claim 17~~8~~, **characterized in that** there is at least one line (21) starting at a branch connection (14) of the first circulation loop (10) downstream of said pump (13) and upstream of said heater/cooler (16) of said first circulation loop (10) and connecting said first circulation loop (10) with said second larger reactor (22) in said second main circulation loop (25).