

CLAIMS

1. Device for carrying out a chemical reaction by a continuous method, wherein said device has a reactor with at least two reactor sections which define a direction of flow, and wherein the reactor has a length and wherein the reactor has plug flow properties along the direction of flow over the whole length of the reactor, characterized in that a recirculation line is provided in order to withdraw a partial flow from the reactor at a first point and return it to the reactor at a second point located before the first point in the direction of flow, and wherein at least one means is provided that prevents a temperature increase in the reactor over a predetermined temperature range, wherein a plurality of temperature sensors are provided that are arranged successively in the direction of flow.

2. Device according to claim 1, wherein the at least one means prevents a temperature change in the reactor of more than 50 K.

3. Device according to any one of Claims 1 or 2, wherein at least part of the plurality of temperature sensors are arranged together in a protective tube.

4. Device according to any one of Claims 1 or 3, wherein an evaluation unit is provided in order to determine a local position along the direction of flow at which a reaction has been ignited inside the reactor based on signals from the plurality of temperature sensors.

5. Device according to any one of Claims 1 through 4, wherein a control unit is provided that controls a recirculation rate of the recirculation line according to the value measured by the temperature sensor.

6. Device according to Claim 5, wherein the recirculation line is connected to the reactor via a controllable pump.

7. Device according to any one of Claims 1 through 6, wherein at least one reactor section is a mixer-heat exchanger.

8. Device according to any one of Claims 1 through 7, wherein the first point is located at a first or second reactor section and wherein the recirculation line leads back from said first point in the direction of the flow.

9. Device according to any one of claims 1 to 8, wherein the reactor has a reactor inlet and a reactor outlet.

10. Device according to claim 9, wherein the recirculation line leads back to the reactor inlet of the reactor of the device.

11. Device according to any one of Claims 8 or 9, wherein the recirculation line leads away at a point of the reactor at which the reaction fluid has a turnover of at least 30%, preferably at least 60%, and even more preferably at least 80%, and wherein the reactor has a volume such that reaction fluid at the outlet of the reactor of the device has a turnover of greater than 80%, preferably greater than 95%, and even more preferably greater than 99%.

12. Device according to any one of Claims 8 through 11, further comprising the reactor inlet of the reactor of the device and the reactor outlet of the reactor of the device, wherein the reactor inlet, the reactor outlet, and the recirculation line have a Bodenstein number of greater than 20 per metre.

13. Device according to any one of Claims 1 through 12, wherein the recirculation line has plug flow properties.

14. Reactor of a device according to any one of Claims 1 through 13, wherein the reactor has at least two reactor sections and is provided with a recirculation line for recirculation of a partial flow.

15. Reactor according to Claim 14, wherein the at least two reactor sections define a direction of flow and the reactor has plug flow properties along the direction of flow, and wherein the recirculation line is configured for withdrawing a partial flow from the reactor at a first point and returning it to the reactor at a second point located before the first point in the direction of flow.

16. Reactor according to any one of Claims 14 or 15, wherein said reactor has at least one temperature sensor for measurement of a temperature and/or a temperature change in the reactor.

17. Control unit of a device according to any one of Claims 1 through 13, wherein said control unit controls a recirculation rate in a recirculation line according to a signal, preferably of a measured temperature sensor value, of at least one temperature sensor.

18. Method for carrying out a chemical reaction in a continuous process, in a device according to any one of Claims 1 through 13 and/or a reactor according to any one of Claims 14 or 16, wherein a material flow in a reactor in a plug flow is continuously fed in a direction of flow, wherein a part of the material flow is at least temporarily withdrawn from the reactor at a distance from a reactor outlet of the reactor and returned in a flow direction before the reactor, and wherein a recirculation rate is selected that prevents

a temperature increase in the reactor above a predetermined temperature change, preferably of approximately 50 K.

19. Method according to Claim 18 for carrying out hydrosilylation, esterification, nitration, diazotization, neutralization, rearrangement, alkylation, halogenation, hydration, oxidation, or polymerization, particularly radical, ionic, anionic, or living polymerization, polyaddition, or polycondensation.

20. Use of a device according to any one of Claims 1 through 13 and/or a reactor according to any one of Claims 14 through 16 for carrying out a chemical reaction, particularly hydrosilylation, esterification, nitration, diazotization, neutralization, rearrangement, alkylation, halogenation, hydration, oxidation, or polymerization, particularly radical, ionic, anionic, or living polymerization, polyaddition, or polycondensation.