blade of a polymerization tank to suppress polymer adhesion (see, for example, Patent Document 2).

List of Prior Art Documents

Patent Documents

[0003]

Patent Document 1: Japanese Patent Laid-Open No. 59-176311

Patent Document 2: National Publication of International Patent Application No. 2012-531515

GB 1 255 764 A1 discloses a method for the preparation of living polymers, wherein the linear velocity of the reaction mixture in the reactor is 0.1 to 3 m/sec for the purpose of preventing backmixing.

Summary of Invention

Problems to be Solved by Invention

[0004]

Even in the methods described in Patent Documents 1 and 2, however, gel generation is not still sufficiently suppressed around a portion where gel generation most easily occurs, namely, a feed port of a polymerization initiator (for example, organolithium compound), and a further improvement is demanded.

[0005]

An object of the present invention is to suppress gel generation around a feed port of an organolithium compound that is a polymerization initiator, thereby preventing incorporation of gel into a product.

Means for Solving Problems

[0006]

The present inventors have made intensive studies in order to solve the problems of the conventional art, and as a result, have found that, when an organolithium compound as an initiator is fed into a polymerization tank, the linear velocity at the feed opening is set to be in the range from 0.1 to 5 m/sec, to thereby significantly suppress gel generation around such a feed port and also sufficiently suppress incorporation of gel into a product, leading to the present invention.

[0007]

The present invention is as follows.

[1] A method for producing a polymer, comprising

step (1) of continuously feeding a monomer comprising a conjugated diene compound and/or an aromatic vinyl compound to a polymerization tank, and

step (2) of continuously feeding a solution comprising an organolithium compound to the polymerization tank, wherein

a linear velocity of the solution comprising the organolithium compound at an opening of a feed port in step (2) is 0.1 to 5 m/sec, wherein the inner diameter of the pipe of the feed port is 3 to 100 mm, and wherein the position in the polymerization tank, at which the solution containing the organolithium compound is supplied is the bottom of the polymerization tank.

[2] The method for producing the polymer according to [1], wherein the monomer comprises at least a conjugated diene compound.

[3] The method for producing the polymer according to [1] or [2], wherein the solution comprising the organolithium

excellent in efficiency. Specifically, a method is included in which a solution containing the organolithium compound in a concentration of 10 to 20% by mass is allowed to flow in one pipe for coupling, a dilution solvent (for example, hydrocarbon solvent) is allowed to flow in the other pipe for coupling, and the solution and the dilution solvent are mixed at the connecting point of both the pipes.

In the above method, a Venturi tube is preferably used for the purpose of an improvement in mixing properties. The dilution solvent flows in the Venturi tube, and the solution containing the organolithium compound in a concentration of 10 to 20% by mass is combined therewith in a throttle part of the Venturi tube, thereby allowing the effect of enhancing uniformity of the organolithium compound to be exerted.

The position in the polymerization tank, at which the solution containing the organolithium compound is supplied, is the bottom of the polymerization tank from the viewpoint of the yield of the polymerization reaction. The bottom of the polymerization tank here means a portion located lower than half the height of the polymerization tank in the longitudinal direction, more preferably a portion located equal to or lower than a fifth of the height of the polymerization tank in the longitudinal direction.

[0034]

distribution of the resulting polymer of the conjugated diene compound and/or the aromatic vinyl compound to be narrow.

[0041]

Examples of the polymerization tank for use in the present embodiment include, but not particularly limited, a bath type or tube type polymerization tank equipped with a stirrer.

[0042]

The polymerization tank for use in the present embodiment has a feed port for feeding the solution containing the organolithium compound. The position of the feed port is not particularly limited, and is preferably located at the bottom portion of the polymerization tank from the viewpoint of operating properties in starting of continuous polymerization. The inner diameter of the feed port can be appropriately selected as long as it is not problematic in imparting the linear velocity at an opening of the feed port of the solution containing the organolithium compound. The inner diameter of the pipe of the feed port is 3 to 100 mm, more preferably 3 to 50 mm, further preferably 5 to 30 mm.

In addition, the relationship between the concentration (C% by mass) of the organolithium compound in the solution and the linear velocity (V m/sec) of the solution at the opening is preferably $1 < (V/C) < 200$,

the outlet pipe at the top portion of the polymerization tank.

[0072]

Industrial Applicability

[0073]

The production method of the present invention enables gel adhesion around the feed port of the polymerization initiator in the polymerization tank to be suppressed, resulting in production of a conjugated diene and/or aromatic vinyl polymer without any gel incorporated.

Claims

[Claim 1]

A method for producing a polymer, comprising

step (1) of continuously feeding a monomer comprising a conjugated diene compound and/or an aromatic vinyl compound to a polymerization tank, and

step (2) of continuously feeding a solution comprising an organolithium compound to the polymerization tank, wherein

a linear velocity of the solution comprising the organolithium compound at an opening of a feed port in step (2) is 0.1 to 5 m/sec, wherein the inner diameter of the pipe of the feed port is 3 to 100 mm, and wherein the position in the polymerization tank, at which the solution containing the organolithium compound is supplied is the bottom of the polymerization tank.

[Claim 2]

The method for producing the polymer according to claim 1, wherein the monomer comprises at least a conjugated diene compound.

[Claim 3]

The method for producing the polymer according to claim 1 or 2, wherein the solution comprising the organolithium compound fed to the polymerization tank has a concentration of the organolithium compound of 0.01 to 1% by mass.