is considered to originate from the dispersion medium.

[0007]

As conventional methods for producing the water-absorbent resin by a reversed-phase suspension polymerization method, known are a method of polymerizing an aqueous solution of α,β-unsaturated carboxylic acid and alkali metal salt thereof in a petroleum hydrocarbon solvent using a radical polymerization initiator in the presence or absence of a internal-crosslinking agent in which a sucrose fatty acid ester is used as a protective colloid agent (see Patent Document 1), and a method of polymerizing a 25% by mass or more of aqueous solution of an α,β-unsaturated carboxylic acid and alkali metal salt thereof in a petroleum hydrocarbon solvent using a radical polymerization initiator in the presence or absence of a internal-crosslinking agent in which a polyglyceryl fatty acid ester with an HLB of 2 to 16 is used as a surfactant (see Patent Document 2). However, these production methods do not focus on reduction of an odor, and thus odors of the resultant water-absorbent resins are not sufficiently low.

[Reference Documents]

[Patent Documents]

[0008]

[Patent Document 1] JP-A No. 61-87702

[Patent Document 2] JP-A No. 62-172006

[Summary ~~of the invention~~]

[Problems to be solved ~~by the Invention~~]

[0009]

An object of the present embodiments disclosed herein~~invention~~ is to provide a method for producing a water-absorbent resin by a reversed-phase suspension polymerization method, wherein an odor originating from a raw material component, in particular, a petroleum hydrocarbon dispersion medium, was further reduced, and to a water-absorbent resin obtained by the method.

[Means for Solving the Problems]

[0010]

The present inventors intensively studied about a relation between an odor originating from a petroleum hydrocarbon dispersion medium when the water-absorbent resin absorbs water, and a petroleum hydrocarbon dispersion medium used in production of the water-absorbent and, as a result, found out to be able to provide a method for producing a water-absorbent resin having a further reduced odor as well as a water-absorbent resin produced by the same method, by dispersing the water-soluble ethylenically unsaturated monomer in the dispersion medium at a specific addition rate, in a method for the reversed-phase suspension polymerization of water-soluble ethylenically unsaturated monomer by using a surfactant in a petroleum hydrocarbon dispersion medium.

[0011]

That is, the present disclosure~~invention~~ relates to a method for producing a water-absorbent resin shown below, and a water-absorbent resin obtained by the method.

Item 1. In one aspect, there is provided a~~A~~ method for producing a water-absorbent resin comprising performing a reversed-phase suspension polymerization of a water-soluble ethylenically unsaturated monomer in a petroleum hydrocarbon dispersion medium by using a surfactant,

a pouring rate upon dispersing an aqueous solution of the water-soluble ethylenically unsaturated monomer in the dispersion medium, is satisfied with the following *conditions*:

(a) an addition rate V_i of the aqueous solution is 0.30 [min^{-1}] or less upon dispersing an aqueous solution of the water-soluble ethylenically unsaturated monomer in the dispersion medium, wherein the addition rate V_i is defined by Equation (I):

$$V_i=F_i\times A_i/T$$

wherein i: Nozzle number (1 to n), n: Number of nozzles($1\leq n\leq 10$), V_i: Addition rate [min^{-1}], F_i: Average linear flow rate from nozzle [m/min], A_i: Cross-section area of nozzle [m^2], and T: Total amount [m^3] of the aqueous monomer solution charged in a polymerization reaction tank; and

(b) a total addition rate V_{total} of the aqueous monomer solution of the water-soluble ethylenically

unsaturated monomer charged in the polymerization reaction tank, is 0.04 [min^{-1}] or more, wherein the total addition rate V_{total} is defined by the following Equation (II):

$V_{total}=\sum V_i$ (i= 1 to n) polymerization tank

wherein V_{total}: Total addition rate [min^{-1}], V_i: Addition rate of each nozzle [min^{-1}], and i and n are as defined in Equation (I), incidentally $V_{total} = V_1$ when the polymerization equipment has one nozzle (n=1).

Item 2. In another aspect, there is provided a~~A~~ method for producing a water-absorbent resin comprising performing a reversed-phase suspension polymerization of a water-soluble ethylenically unsaturated monomer in a petroleum hydrocarbon dispersion medium by using a surfactant,

a pouring rate upon dispersing an aqueous solution of the water-soluble ethylenically unsaturated monomer in the dispersion medium, is satisfied with the following conditions:

(a) an addition rate V_i of the aqueous solution is 0.30 [min^{-1}] or less upon dispersing an aqueous solution of the water-soluble ethylenically unsaturated monomer in the dispersion medium, wherein the addition rate V_i is defined by Equation (I):

$V_i=F_i\times A_i/T$

wherein i: Nozzle number (1 to n), n: Number of nozzles($1\leq n\leq 10$), V_i: Addition rate [min^{-1}], F_i: Average linear flow rate from nozzle [m/min], A_i: Cross-section

area of nozzle [m^2], and T: Total amount [m^3] of the aqueous monomer solution charged in a polymerization reaction tank; and

(b) a total addition rate V_{total} of the aqueous monomer solution of the water-soluble ethylenically unsaturated monomer charged in the polymerization reaction tank, is 0.08 [min^{-1}] or more, wherein the total addition rate V_{total} is defined by the following Equation (II):

$$V_{total}=\sum V_i \quad (i= 1 \text{ to } n) \text{ polymerization tank}$$

wherein V_{total}: Total addition rate [min^{-1}], V_i: Addition rate of each nozzle [min^{-1}], and i and n are as defined in Equation (I), incidentally $V_{total} = V_1$ when the polymerization equipment has one nozzle (n=1).

Item 3. The method for producing water-absorbent resin according to Item 1 or 2, wherein n is $2 \leq n \leq 10$.

Item 4. The method for producing water-absorbent resin according to any one of Items 1-3, wherein the water-soluble ethylenically unsaturated monomer is dispersed in the petroleum hydrocarbon dispersion medium before the polymerization by using the surfactant, and then the polymerization is performed by using a water-soluble radical polymerization initiator.

Item 5. A water-absorbent resin obtained by the method according to any one of Items 1-4.

[Effects ~~of the Invention~~]

[0012]

According to the present disclosure~~invention~~, a method for producing a water-absorbent resin, wherein an odor originating from a raw material component, in particular, a petroleum hydrocarbon dispersion medium, is reduced, and a water-absorbent resin obtained by the method are provided.

[Modes for Carrying Out the Invention]

[0013]

The present invention relates to a method for producing a water-absorbent resin comprising performing a reversed-phase suspension polymerization of an aqueous solution of a water-soluble ethylenically unsaturated monomer (hereinafter, an "aqueous monomer solution" means an "aqueous solution of a water-soluble ethylenically unsaturated monomer" unless otherwise expressly indicated) in a petroleum hydrocarbon dispersion medium (hereinafter, a "dispersion medium" means a "petroleum hydrocarbon dispersion medium" unless otherwise expressly indicated) in the presence of a surfactant, wherein the aqueous monomer solution is added at a specific addition rate, and to a water-absorbent resin obtained by the method.

An origin of odor, when a water-abosorbent resin obtained by a reversed-phase suspension polymerization absorbs water, is mainly a dispersion medium remained within particles of the water-abosorbent resin. The present inventors have found out that a mechanism of a dispersion medium remaining in water-absorbent resin