Claims

1. A water treatment method comprising:

a softening step of softening, by using an ion exchange resin, water to be treated containing one or two types of divalent anions selected from the group consisting of SO_4^{2-} and CO_3^{2-}, a hardness component, Na^+ and Cl^-;

a nanofiltration step of separating, by using a nanofiltration membrane, the water softened in the softening step into permeate water and a concentrated liquid from the nanofiltration membrane;

a reverse osmosis step of separating, by using a reverse osmosis membrane, the permeate water from the nanofiltration membrane into permeate water and concentrated water from the reverse osmosis membrane; and

an ion exchange resin regeneration step of regenerating the ion exchange resin by using the concentrated water from the reverse osmosis membrane, wherein

the nanofiltration membrane has a rejection rate for NaCl of 70% or less and a rejection rate for the divalent anion of 90% or more.

2. The method according to claim 1, wherein the water softened in the softening step has a SO_4^{2-} concentration of 10 mg/L or more and 10000 mg/L or less and a CO_3^{2-} content of 10 mg/L or less in terms of $CaCO_3$.

3. The method according to claim 1 or 2, wherein in the permeate water from the nanofiltration membrane has a SO_4^{2-} concentration of less than 10 mg/L.

4. A water treatment apparatus comprising:

a softening unit comprising an ion exchange resin;

a nanofiltration unit comprising a nanofiltration membrane;

a reverse osmosis unit comprising a reverse osmosis membrane,

a line connecting a softened water outlet of the softening unit to an inlet of the nanofiltration unit;

a line connecting a permeate water outlet of the nanofiltration unit to an inlet of the reverse osmosis unit; and

a line connecting a concentrated liquid outlet of the reverse osmosis unit to a regenerant inlet of the softening unit, wherein

the nanofiltration membrane has a rejection rate for NaCl of 70% or less and a rejection rate for the divalent anion of 90% or more.

5. A method for regenerating an ion exchange resin, comprising:

a softening step of softening, by using an ion exchange resin, water to be treated containing one or two types of divalent anions selected from the group consisting of SO_4^{2-} and CO_3^{2-}, a hardness component, Na^+ and Cl^-;

a nanofiltration step of separating, by using a nanofiltration membrane, the water softened in the softening step into permeate water and a concentrated liquid from the nanofiltration membrane;

a reverse osmosis step of separating, by using a reverse osmosis membrane, the permeate water from the nanofiltration membrane into permeate water and concentrated water from the reverse osmosis membrane; and

an ion exchange resin regeneration step of regenerating an ion exchange resin by using the concentrated water from the reverse osmosis membrane, wherein

the nanofiltration membrane has a rejection rate for NaCl of 70% or less and a rejection rate for the divalent anion of 90% or more.