CLAIMS

1. A treatment apparatus for a hardness component-containing water comprising:

a reaction tank for adding at least one of an alkaline agent and a carbonate compound to a water to be treated containing a hardness component, thereby insolubilizing the hardness component,

a polymer reaction tank for adding a polymer flocculant to the reaction liquid obtained in the reaction tank to conduct a flocculation reaction,

a solid-liquid separation unit for performing a solid-liquid separation of an obtained insoluble material,

a reverse osmosis membrane treatment unit for treating an obtained solid-liquid separation liquid with a reverse osmosis membrane to obtain a concentrate and a permeate, and

a return unit for returning at least a portion of an obtained concentrate to the reaction tank;

wherein return of the concentrate is performed so as to achieve a $CaCO_3$ concentration in the reaction tank of at least 100 mg/L.

2. The treatment apparatus for a hardness component-containing water according to Claim 1, further comprising

an ion concentration measurement unit that measures an ion concentration of the concentrate, wherein

an amount of the concentrate returned by the return unit is adjusted in accordance with a measured value from the ion concentration measurement unit.

3. A treatment method for a hardness component-containing water comprising:

an insolubilization step of adding at least one of an alkaline agent and a carbonate compound to a water to be treated containing a hardness component, thereby insolubilizing the hardness component,

a flocculation step of adding a polymer flocculant to the reaction liquid obtained in the insolubilization step to conduct a flocculation reaction,

a solid-liquid separation step of performing a solid-liquid separation of an obtained insoluble material,

a reverse osmosis membrane treatment step of treating an obtained solid-liquid separation liquid with a reverse osmosis membrane to obtain a concentrate and a permeate, and

a return step of returning at least a portion of an obtained concentrate to reaction tank to which at least one of the alkaline agent and the carbonate compound is added;

wherein return of the concentrate is performed so as to achieve a $CaCO_3$ concentration in the reaction tank of at least 100 mg/L.

4. The treatment method for a hardness component-containing water according to Claim 3, wherein

an ion concentration of the concentrate is measured, and an amount of the concentrate returned in the return step is adjusted in accordance with a measured value for the ion concentration.