However, the anammox bacteria have a division time (i.e., doubling time) of about 10 days, which means that the proliferation rate is significantly low. Therefore, it takes about 6 months for starting up to obtain a nitrogen removal speed of 1 kg-N/m^3/day, which is defined as the amount of ammonia nitrogen produced per unit volume per day. For this type of apparatus, it is required that the start-up period at a user site be within 1 month, so a problem is that the user requirements cannot be satisfied by merely using anammox bacteria.

[0008]

Embodiments of the present invention provide a carrier for retaining anammox bacteria, an anammox bacteria-adhered particle, and a wastewater treatment apparatus that can remarkably reduce the start-up period for obtaining a nitrogen removal speed of 1 kg-N/m^3/day.

SOLUTION TO PROBLEM

[0009]

Embodiments of the present invention are characterized in that carbon particles are used as a bacteria carrier.

According to a first aspect of the present invention, there is provided an anammox bacteria adhering carrier, the anammox bacteria adhering carrier comprising carbon particles, wherein the carbon particles have an average particle size of 2 μm to 1000 μm.

According to a second aspect of the present invention, there is provided an anammox bacteria retaining carrier, the anammox bacteria retaining carrier comprising artificial graphite particles.

According to a third aspect of the present invention, there is provided an anammox bacteria retaining carrier, the anammox bacteria retaining carrier consisting essentially of carbon particles, wherein the carbon particles have an average particle size of 2 μm to 1000 μm.

According to a fourth aspect of the present invention, there is provided an anammox bacteria retaining carrier, the anammox bacteria retaining carrier comprising carbon particles, wherein the carrier has an apparent zeta potential of −35 mV to 0 mV.

According to a fifth aspect of the present invention, there is provided an anammox bacteria-adhered particle comprising the carrier according to the above aspects, to which anammox bacteria are adhered.

According to a sixth aspect of the present invention, there is provided an wastewater treatment apparatus, characterized in that the above anammox bacteria-adhered particle according to claim 6 is disposed in a wastewater treatment tank.

According to a seventh aspect of the present invention, there is provided an wastewater treatment apparatus, characterized by comprising a wastewater treatment section that treats wastewater by stirring and flowingly moving the above anammox bacteria-adhered particle, and a waste material reserving section that stores carbon particles that have lost anammox activity and from which the anammox bacteria have been detached, the wastewater treatment section and the waste material reserving section being separated from each other.

According to an eighth aspect of the present invention, there is provided an wastewater treatment apparatus, characterized by comprising the above anammox bacteria-adhered particle and a nitrifying bacteria-adhered particle in which nitrifying bacteria are adhered to carbon particles, the anammox bacteria-adhered particle and the nitrifying bacteria-adhered particle being disposed in a common wastewater treatment tank.

ADVANTAGEOUS EFFECTS OF INVENTION

[0010]

Embodiments of the present invention achieve a significant advantageous effect of remarkably reducing the start-up period for obtaining a nitrogen removal speed of 1 kg-N/m^3/day.

BRIEF DESCRIPTION OF DRAWINGS

[0011]

[Fig. 1] Fig. 1 is a schematic view illustrating a wastewater treatment apparatus used in Example 1.

CLAIMS

1. An anammox bacteria adhering carrier, the anammox bacteria adhering carrier comprising carbon particles, wherein the carbon particles have an average particle size of 2 μm to 1000 μm.

2. An anammox bacteria retaining carrier, the anammox bacteria retaining carrier comprising artificial graphite particles.

3. An anammox bacteria retaining carrier, the anammox bacteria retaining carrier consisting essentially of carbon particles, wherein the carbon particles have an average particle size of 2 μm to 1000 μm.

4. An anammox bacteria retaining carrier, the anammox bacteria retaining carrier comprising carbon particles, wherein the carrier has an apparent zeta potential of −35 mV to 0 mV.

5. The carrier according to any one of claims 1 to 3, wherein the carrier has an apparent zeta potential of −35 mV to 0 mV.

6. The carrier according to any one of claims 4 to 5, wherein the carbon particles have an average particle size of 2 μm to 1000 μm.

7. An anammox bacteria-adhered particle comprising the carrier according to any one of claims 1 to 6, to which anammox bacteria are adhered.

8. A wastewater treatment apparatus, characterized in that the anammox bacteria-adhered particle according to claim 7 is disposed in a wastewater treatment tank.

9. A wastewater treatment apparatus, characterized by comprising a wastewater treatment section that treats wastewater by stirring and flowingly moving the anammox bacteria-adhered particle according to claim 7, and a waste material reserving section that stores carbon particles that have lost anammox activity and from which the anammox bacteria have been detached, the wastewater treatment section and the waste material reserving section being separated from each other.

10. A wastewater treatment apparatus, characterized by comprising the anammox bacteria-adhered particle according to claim 7 and a nitrifying bacteria-adhered particle in which nitrifying bacteria are adhered to carbon particles, the anammox bacteria-adhered particle and the nitrifying bacteria-adhered particle being disposed in a common wastewater treatment tank.

11. The wastewater treatment apparatus according to any one of claims 8 to 10, further comprising a carbon particle supply unit that supplies carbon particles constantly or intermittently.