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Deoiling and purification device for emulsified wastewater

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ABSTRACT

This invention discloses a deoiling and purification device for emulsified wastewater based on the materials with superhydrophobic/superlipophilic and superhydrophilic/superlipophilic feature of surface wetting. The device takes super hydrophobic/super hydrophilic sponge and super hydrophilic/super hydrophilic mesh membrane as core separation components, and the sponge and mesh membrane are arranged inside the centrifugal cyclone separation tank. Under the centrifugal separation, emulsified oil droplets located inside the cyclone can easily wet and spread on the surface of super hydrophilic/super hydrophilic mesh membrane and be captured by super hydrophobic/super hydrophilic sponge, while water is blocked and distributed outside the cyclone, thus realizing demulsification and separation of emulsified wastewater. The deoiling purification device has the advantages of low manufacturing cost, simple treatment process, and it does not need both adsorbent and demulsifier, and has small secondary pollution, high treatment efficiency with low cost, and strong adaptability and the like. It can solve the problems existing in the prior demulsification technology, and has wide application prospects.

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FIGURES

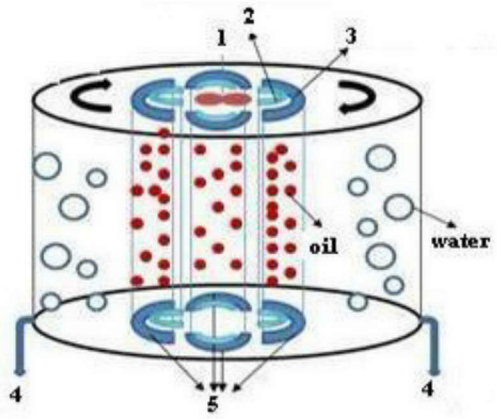


Figure 1

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Deoiling and purification device for emulsified wastewater

TECHNICAL FIELD

This invention is in the field of oily emulsified wastewater deoiling and purifying, particularly relates to emulsified wastewater deoiling and purifying device based on special wetting material, the device is based on superhydrophilic/superlipophilic mesh membrane and superhydrophobic/superlipophilic sponge, the demulsification and deoiling purification of emulsified wastewater can be realized by simple centrifugal cyclone treatment, which successfully overcomes the problems existing in the prior demulsification and separation technology of emulsified wastewater.

BACKGROUND

Oil-water separation has always been an important content in the field of oil purification. Although traditional separation technologies such as sedimentation, adsorption, centrifugation, vacuum separation and cyclone separation can better separate non-emulsion oily wastewater, in many cases, the oil in oily wastewater does not exist in free form, it forms stable O/W dispersed phase droplets under the action of interfacial active substances such as organic acids and organic alcohols. The interfacial transfer behavior of oil droplets is seriously hindered due to the existence of surrounding interfacial films. Therefore, demulsification and deoiling of emulsified wastewater has been a difficult problem to be solved in the field of oily wastewater treatment for a long time.

Chemical demulsifiers can quickly absorb or partially replace the natural interfacial active substances that make up the oil-water interfacial film, and form a mixed film with lower strength than the original interfacial film, which leads to the destruction of the interfacial film and completes the demulsification process, so it is still the method with the best demulsification effect and the most application at present. However, it is well-known that chemical demulsifiers are difficult to recover and recycle during use, and are usually discharged to the environment along with sewage, which not only causes high demulsification costs, but also brings serious secondary pollution problems. In

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recent years, the technology of biological demulsification and electric demulsification has been developing continuously, but its practical application effect is still not ideal.

The appearance of new materials with feature of surface wetting has made it possible to realize the rapid demulsification and purification of emulsion by physical means. By reasonable technical means, the technology not only can deoil and purify emulsified wastewater, but also avoids the extensive use of chemical demulsifiers, and reduces the secondary pollution emission, while the cost of treatment unit and treatment cost can be lowered. However, up to now, there are still few demulsification and deoiling devices for emulsified wastewater based on materials with feature of surface wetting, which is due to the lack of a comprehensive solution of using special material with feature of surface wetting to solve demulsification and deoiling of emulsified wastewater.

In order to make the special material with feature of surface wetting be really applied to solve the demulsification and deoiling problem of emulsified wastewater, the present invention creatively combines super hydrophilic/super lipophilic mesh membrane with super hydrophobic/super lipophilic sponge, and skillfully utilizes centrifugal separation principle to construct a brand-new demulsification and deoiling purification and separation device for emulsified wastewater, so that emulsified wastewater can be quickly demulsified, deoiled and purified by simple physical treatment, and the purification efficiency of emulsified wastewater is greatly improved, which solves the difficult problem of emulsion demulsification purification that cannot be solved by traditional oil-water separation technology, and the defects such as complex treatment unit, low treatment efficiency, high treatment cost, poor adaptability of demulsifier and large secondary pollution are all fixed, therefore, the special material with feature of surface wetting can be truly applied to water treatment engineering.

SUMMARY

In order to solve the defects and problems existing in the prior art in the field of demulsification, purification and separation of emulsified wastewater, this invention provides a demulsification, purification and separation device based on superhydrophilic/superlipophilic mesh membrane and

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superhydrophobic/superoleophilic sponge with special material with feature of surface wetting.The device has the characteristics of low manufacturing cost, simple treatment, high efficiency, strong adaptability, low treatment cost and less secondary pollution, and is very suitable for demulsification and purification of emulsified wastewater. Once the device is popularized and implemented, it will be possible to solve the problems existing in the previous demulsification and deoiling technology.

The technical scheme adopted by the invention to solve the technical problems is as follows:

(1) Modifying The surface micro-morphology and wetting characteristics of stainless steel mesh by chemical surface treatment technology, and the stainless steel mesh is made into a mesh membrane with superhydrophilic/superlipophilic with feature of surface wetting, which is used as the core processing component of emulsified wastewater treatment device.

(2) Immersing melamine sponge in octadecyl trichlorosilane for surface treatment to obtain sponge with feature of surface wetting of superhydrophobic/superlipophilic sponge, which is used as the core treatment component of emulsified wastewater treatment device.

(3) Constructing a cylindrical centrifugal separation device that consists of oil inlet, centrifugal pump, spiral stirrer, superhydrophilic/superlipophilic mesh membrane layer, superhydrophobic/superlipophilic sponge layer, sponge extrusion plate, water outlet and oil outlet.

(4) Because the dispersed oil droplets of emulsified wastewater are lighter than water, they will be more distributed inside the cyclone while water will be more outside under centrifugal separation. When the dispersed oil droplets distributed inside to contact the superhydrophilic/superlipophilic mesh membrane, the dispersed oil droplets will quickly infiltrate and spread on the surface of the mesh membrane, resulting in the destruction of dispersion steady state. Meanwhile, oil and water will pass through the mesh membrane and continue contacting with the superhydrophobic/superlipophilic sponge, in where the oil will be captured by the superlipophilic sponge.

(5) When the emulsified wastewater gradually becomes clear, the device opens the water outlet, and the purified clear water flows out from the water outlet. After the

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sponge is used for a period of time, the sponge squeezing plate squeezes the sponge and the squeezed oil flows out from the oil outlet. After the above treatment, the emulsified wastewater can be completely purified, and the purification rate can reach over 98%.

The advantages of this invention are:

(1) Compared with the current demulsification and purification technology of emulsified wastewater, the demulsification and purification process can be completed at one time with fewer treatment units, and the costs of treatment units and equipment investment and treatment are all lower than the prior art.

(2) Fully exploiting the feature of highly efficient oil-water separation materials on special interface of water and oil to rapidly realize the demulsification and separation of water and oil with remarkable separation effect and high treatment efficiency.

(3) The demulsification purification and separation device provided by this invention does not need to use demulsifiers, adsorbents and other raw materials that cause environmental pollution and increase the treatment cost, it provides a treatment process that is clean and environment-friendly with strong adaptability, and it can be applied for treating various emulsified wastewater, therefore, the invention solves the technical bottleneck problem existing in the prior oil-water separation technology.

BRIEF DESCRIPTION OF THE FIGURES

The present invention will be further explained with reference to the attached drawings and examples, with reference to the attached figure 1.

The centrifugal pump drives the paddle 1 to rotate, so that the emulsified wastewater in the device rotates. The dispersed oil droplets are wetting and spreading on the surface of the super-lipophilic/super-hydrophilic mesh 2 after contact, and passing through the mesh under the centrifugal force, and continue contacting with the super-lipophilic/super-hydrophobic sponge 3. During the contact process, the oil is gradually captured by the sponge, the water is blocked and becomes clear gradually, and the separated water is discharged from the outlet 4, while the oil is discharged from the outlet 5.

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DESCRIPTION OF THE INVENTION

The following embodiment describes the method the invention applies for demulsification and purification of the emulsified wastwater

(1) Immersing 304 stainless steel mesh with a pore diameter of 0.1Mm in a solution consisting of 1M copper chloride and 1m hydrochloric acid for 16s, then taking it out to make it stand in the air to dry, washing with deionized water and drying it, thus obtaining a stainless steel mesh membrane with super hydrophilic/super lipophilic with feature of surface wetting.

(2) The melamine sponge was immersed in octadecyltrichlorosilane for surface treatment for 24h, obtaining the hydrophobic/super lipophilic sponge with feature of surface wetting.

(3) The superhydrophilic/superlipophilic mesh membrane and super hydrophobic/superlipophilic sponge are respectively installed near the center of the cylindrical separation tank in the order of inside first and then outside.

(4) The centrifugal pump and rotating paddle are located in the center of the cylindrical device to ensure that the rotating centrifugal force uniformly drives the fluid to rotate

(5) The annular sponge extrusion plate is located above the cylindrical device, and does not contact with the sponge at ordinary times, and intermittently extrudes the sponge to discharge oil.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Deoiling and purification device for emulsified wastewater is characterized in

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FIGURES

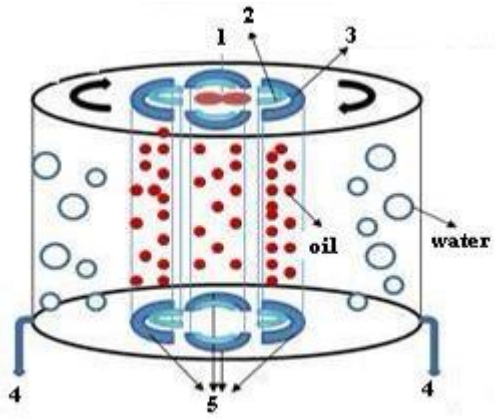


Figure 1