Using inexpensive recycled carbon fiber, FujiTechno Corporation developed the water treatment media Misty as a joint project with the Department of Environmental Systems Engineering at Ritsumeikan University.

Superb potential and properties of Misty

Past models of water treatment media that incorporate carbon fiber have been susceptible to the loss of individual carriers due to water flow. Other methods of using water treatment media have the drawback that they cannot recycle the media.

After adsorbing harmful micropollutants from water, Misty can be recycled for use as water treatment media by burning the adsorbate together with the media and retrieving only the recycled carbon fibers. Misty contributes to environmental conservation by purifying water and by sustainably recycling its own media material.

Conversely, methods that use a plastic carrier for water treatment media dispose of the carrier after use as waste. This process leads to environmental contamination and destruction of oceans and the atmosphere by microplastics.

Use of Misty solves the problem of continuously accumulating carbon fibers.

In recent years, the demand for carbon fiber-based products has grown rapidly, with the world production volume of polyacrylonitrile (PAN)-based carbon fibers estimated at 70,000 tons per year. In this scenario, huge amounts of waste carbon fiber will be produced in the near future. Therefore, establishing a way of making good use of discarded carbon fibers is urgently necessary.

FujiTechno has studied the use of discarded carbon fiber and recycled carbon fiber (RCF) for water treatment as a joint project with the Department of Environmental Systems Engineering at Ritsumeikan University. This joint project has completed the development of Misty, a water treatment media that adsorbs and removes harmful micropollutants (Japanese patent: 7077502).

Water purification and the removal of harmful heavy metals is the biggest challenge for the future.

The effectiveness of Misty is not limited to reducing oil content, aromatic hydrocarbons, BOD, and COD in water; it also removes harmful heavy metal pollutants present at very low levels, including copper (Cu), lead (Pb), zinc (Zn), chromium (Cr), cadmium (Cd), and nickel (Ni).

Conventional adsorbents are a source of microplastics and a cause of environmental degradation. In contrast, after use as water treatment media, Misty can be recycled by burning the media and retrieving only the recycled carbon fiber. In this way, it is environmentally friendly and contributes to reduced waste.

Heavy metals and other contaminants are washed from road surfaces as street drainage.

External environmental pollution sources to lakes, swamps, and rivers include rice paddies, rangelands, crop fields, and urban areas. Urban regions in particular have a large potential pollution impact from road surfaces because road surfaces account for 20 to 30% of the usable land area.

In urban areas, the pollution impact of street drainage results from human activities and contains airborne dust, fall dust, automotive exhaust gas, wear debris of tires, flakes of paint from automobiles, and other contaminants. In addition, when it rains, untreated contaminants flow into public water channels. Street drainage contains harmful micropollutants such as heavy metals and PAHs, as well as nitrogen, phosphorus, and other nutrient salts and organic substances.

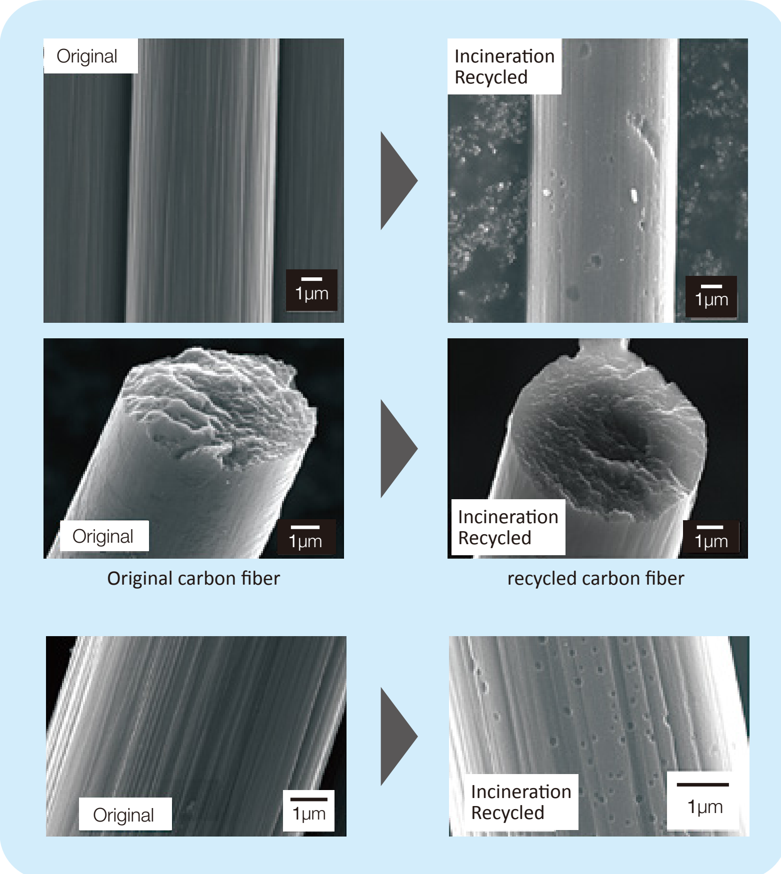
Other noticeable contaminants in street drainage include six heavy metals, Cu, Pb, Zn, Cr, Cd, and Ni. In internal combustion engines, PAHs are produced when gasoline or light oil is burned and emitted along with the exhaust gas. These substances are deposited on road surfaces as airborne dust and fall dust and flow out as drainage. Building systems designed to remove these harmful micropollutants is an urgent issue for clean water.

Best suited to water purification for young fish and shellfish

Misty also functions as an alternative to filters for growing bacteria for water purification. It is more durable than the filters in common use. In addition, it is a high-functionality product that is cleanable and reusable.

Structure and Properties of Recycled Carbon Fiber

After burning at 600°C, fiber surfaces were observed to have pits due to oxidation. Although its strength decreased by approximately 30%, the fiber proved acceptable for use as water treatment media.
(Source: March 2012 paper by MONONOBE Ruriko, Advanced Materials and Structural Engineering Lab., Doshisha University)



Structure of Misty (Patented)

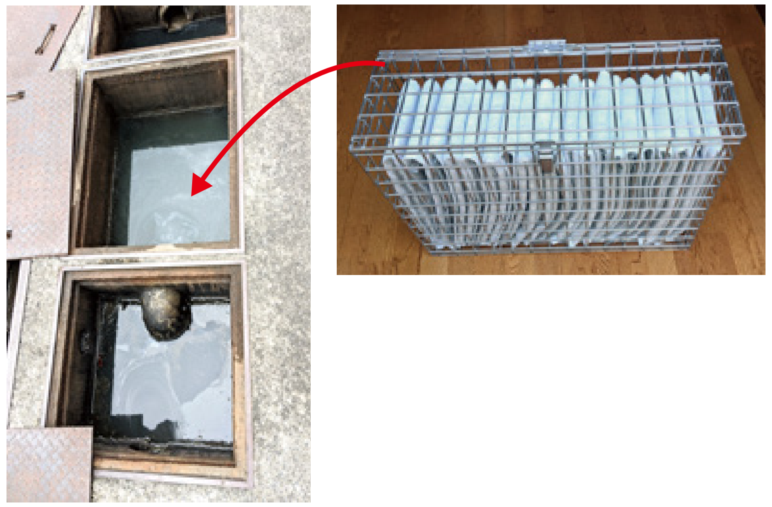
Fibrillated RCF → Nonwoven RCF fabric → Wrapped in felt and made into a unit

Construction/Installation Examples

(1) Installation in a street drainage facility

Misty　HumeCeptor

(2) Drainage conduit at gas station



(3) Experimental example using a drainage facility at a brewery

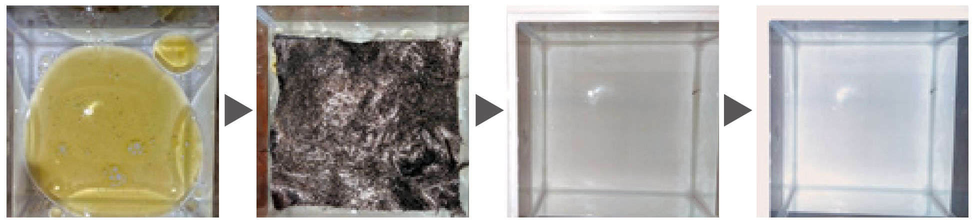
Experimenting bacterial cultivation using RCF

Experimental examples using RCF

Experiment (1) A tank is filled with a solution of kaolin and glycose. The blower is loaded with 3 g of RCF. Changes with time are observed.

RCF placed in blower ▶ Immediately after pouring the solution ▶ 1 h later ▶ 2 h later ▶ 3 h later ▶ 4 h later

Experiment (2) Engine oil is added to a tank. Changes with time are observed.



Engine oil added ▶ RCF placed in tank ▶ 24 h later ▶ 72 h later