Water Purification System Based on Visible-Light-Responsive Graphitic Carbon Nitride

Researchers at The George Washington University (GW) have worked on the development and optimization of a carbon nitride based photo-catalytic membrane system in order to create an advanced technology for the purification of water.

Our society is currently facing great challenges from environmental pollution. Many organic pollutants such as pharmaceuticals and personal care products, pesticides, and endocrine compounds, are resistant to conventional wastewater and water treatment processes. In order to overcome the challenges these pollutants pose, GW researchers have developed a novel system based on photocatalysis, which is a promising green technology that can use renewable solar energy for the destruction of persistent waterborne organic pollutants.

While numerous photo-catalysts have been explored, they generally suffer from limited visible light absorption, low reactivity, instability, and/or high cost. The breakthrough photo-catalyst technology developed by GW researchers, which is based on graphitic carbon nitrides, overcomes many of these limitations. The proposed system is visible light responsive and has a low production cost. In addition, it is based on a novel polymeric photo-catalyst which is both physically and chemically stable.

This technology has a wide applicability because it includes not only drinking water treatment but also entire advanced wastewater treatment systems, such as municipal waste water and industrial wastewater. One of the greatest advantages of this particular technology is that, instead of being responsive only to UV-light, our membrane system is also responding to the visible light, which means that, in a comparison with the currently available technologies, the system will be able to capture and use a greater amount of the solar energy available. Consequently, this will also reduce operating costs, and fossil fuel consumption and the resulting carbon footprint.

Applications:

- Advanced treatment of industrial wastewater.
- Innovative systems for the treatment of municipal wastewater.
- Drinking water purification systems in general.

Advantages:

- These photo-catalysts are responsive to visible light and they are also able to utilize more solar energy than the currently existing photo-catalyst technologies, which are responsive only to UV-light.
As a consequence of this advantage, this technology will also reduce the consumption of fossil fuel energy.

The Photocatalytic Membrane Reactor

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