A cheaper method to recycle activated carbon

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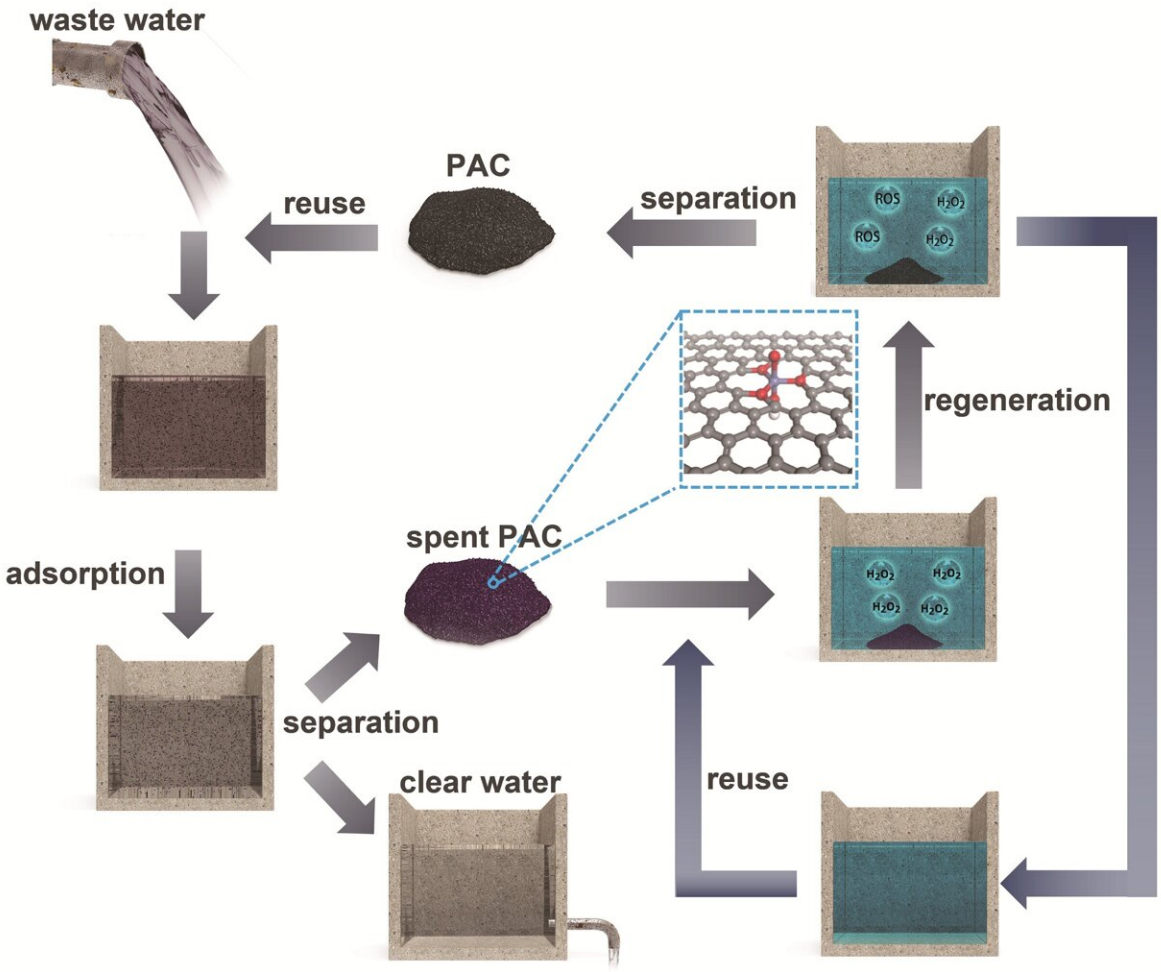

The H2O2-based PAC adsorption/regeneration process for wastewater treatment. Credit: NIMTE

A research group led by Prof. Lu Zhiyi at the Ningbo Institute of Materials Technology and Engineering (NIMTE) of the Chinese Academy of Sciences has proposed a facile and cost-effective strategy to regenerate powdered activated carbon (PAC) by anchoring isolate Fe atoms on commercial PAC.

The results were published in *Advanced Science*.

Water is the basis of human existence. However, the increasing shortage of fresh water has become a growing concern in our daily life, which calls for effective measures such as waste water treatment and reuse.

Thanks to the advantages of large adsorption capacity, high specific surface area, nontoxicity, and acid/base resistance, PAC plays an irreplaceable role in drinking water purification and wastewater treatment, which serves as an efficient adsorbent to remove organic pollutants from wastewater. However, the existing PAC regeneration technologies still needs upgrading due to its high cost.

In this study, the researchers constructed isolated iron (Fe) sites anchored on commercial PAC (i.e., Fe-PAC), realizing the regeneration of Fe-PAC in H_2O_2 solution treatment at a low expense efficiently.

With Rhodamine B as a representative pollutant, the results of cyclic adsorption-regeneration experiment show that the absorption capability of the synthesized Fe-PAC could be regenerated over ten cycles within 24h.

Superior to the traditional Fenton-based regeneration technology, the synthesized Fe-PAC with a relatively low cost of ≈\$0.35 kg^{-1} shows higher regeneration efficiency (70.5–92.7%), lower loss rate of absorbent (≈8.25% per cycle), as well as lower H_2O_2 dosage (2.31 g $g(PAC)^{-1}$).

In addition, the Fe-PAC-based adsorption-regeneration process shows excellent general applicability, which could be extended to other simulated wastewater with contaminants like methylene blue and crystal violet.

Furthermore, the study has illuminated for the first time the vital role of atomic dispersion sites in PAC regeneration.

This promising strategy for PAC regeneration shows bright and broad application prospects in large-scale cost-effective wastewater treatment.

More information: Xu Chen et al, Cost-Effective H_2O_2 -Regeneration of Powdered Activated Carbon by Isolated Fe Sites, *Advanced Science* (2022). DOI: 10.1002/advs.202204079

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