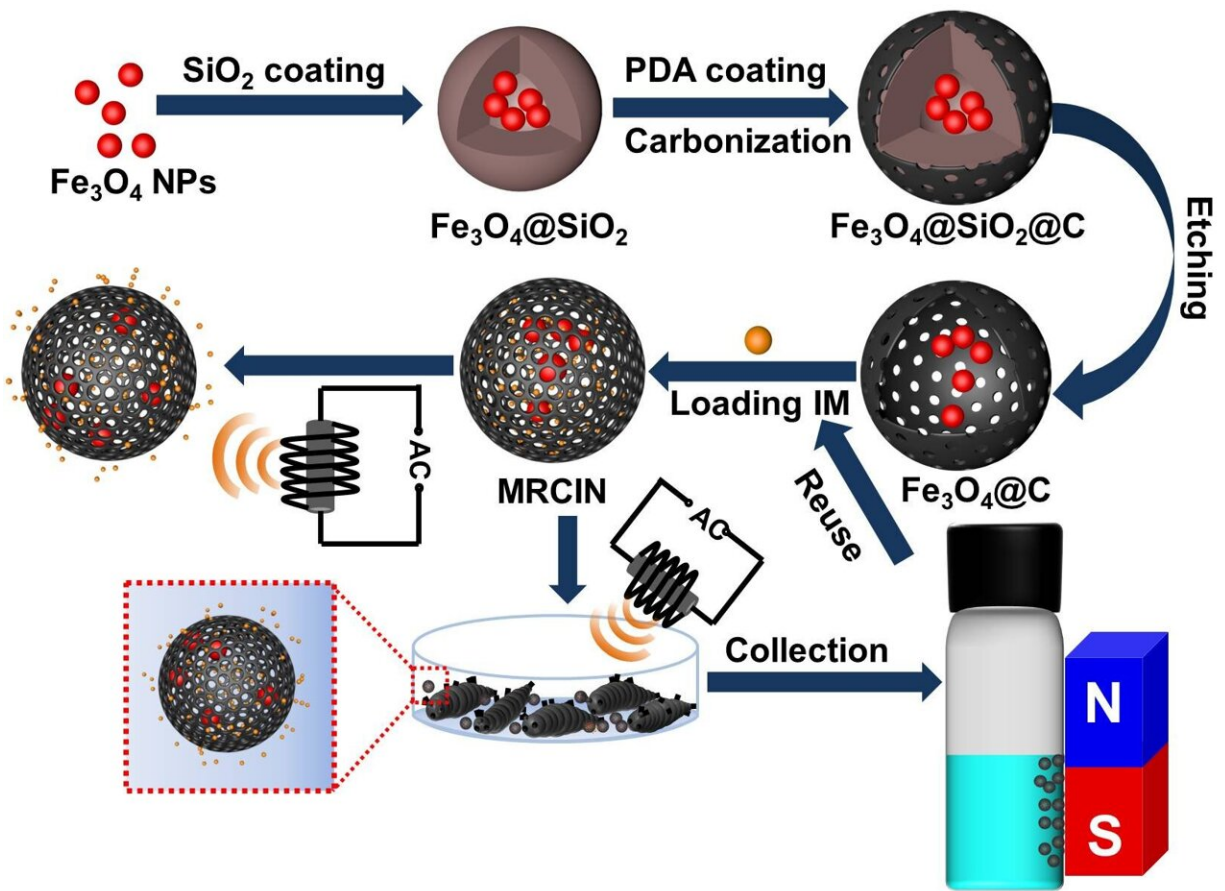


# Alternating magnetic field-responsive nano-platform developed for controlled pesticide release

July 29 2021, by Zhang Nannan



Schematic illustration of the mechanism. Credit: ZHANG Lihong

Pesticides play a key role in controlling weeds, pests, and diseases in modern agriculture to promote crop yield. As one of the most extensively used neonicotinoid insecticides, imidacloprid can effectively kill insects. However, such pesticides tended to enter the atmosphere, water and soil easily through runoff, volatilization, and leaching, resulting in serious environmental problems and even hazards to the health of human beings. It's urgent to develop new methods to control the pesticide loss.

A joint research team led by Prof. Wu Zhengyan from the Hefei Institutes of Physical Science (HFIPS) of the Chinese Academy of Sciences (CAS) developed a novel pesticide system, named magnetic field-responsively controlled-release imidacloprid nano-platform (MRCIN), to improve utilization efficiency of imidacloprid. The result was published in *ACS Sustainable Chemistry & Engineering*.

In this work, researchers fabricated MRCIN by loading imidacloprid in yolk-shell  $\text{Fe}_3\text{O}_4@\text{C}$ . The  $\text{Fe}_3\text{O}_4@\text{C}$  with a large (Brunauer, Emmett and Teller) BET surface area acted as a carrier for imidacloprid. The most interesting thing was that the  $\text{Fe}_3\text{O}_4$  (ferrosferric oxide) nanoparticles in MRCIN could vibrate under varied [electromagnetic field](#) to boost release of imidacloprid.

Therefore, MRCIN presented an excellent alternating [magnetic field](#)-responsively controlled-release performance via designing the frequency and voltage. After release, the existence of  $\text{Fe}_3\text{O}_4$  nanoparticles was in favor of the collection of MRCIN from water. Besides, MRCIN could be reutilized at least three times.

The work provides a simple and potential way to achieve the controlled release of imidacloprid, improve utilization efficiency, and decline pollution to environment.

**More information:** Lihong Zhang et al, Alternating Magnetic Field-Responsive Nanoplatfoms for Controlled Imidacloprid Release and Sustainable Pest Control, *ACS Sustainable Chemistry & Engineering* (2021). [DOI: 10.1021/acssuschemeng.1c02135](https://doi.org/10.1021/acssuschemeng.1c02135)

Provided by Chinese Academy of Sciences

Citation: Alternating magnetic field-responsive nano-platform developed for controlled pesticide release (2021, July 29) retrieved 25 June 2024 from <https://phys.org/news/2021-07-alternating-magnetic-field-responsive-nano-platform-pesticide.html>

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