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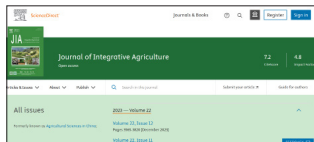
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Cover Story Modern agriculture faces unprecedented challenges from population growth, arable land scarcity, freshwater shortage, and environmental degradation caused by inefficient agrochemical use. Metal-organic frameworks (MOFs), emerging as a class of porous crystalline nanomaterials with tunable structures, high porosity, and versatile functionality, offer promising solutions to these pressing issues. This review comprehensively summarizes recent advances in MOFs-based agricultural applications, encompassing four critical dimensions: green design and synthesis strategies emphasizing structural stability and circular economy principles; eco-friendly remediation of diverse pollutants including pesticides, heavy metals, microplastics, antibiotics, and greenhouse gases; sustainable technologies for atmospheric water harvesting, seawater desalination, and green ammonia synthesis; and smart agricultural systems enabling controlled agrochemical release and real-time environmental monitoring. By integrating AI-assisted design, improved recyclability, and scalable production, MOFs demonstrate exceptional potential to transform conventional agriculture toward greener, more sustainable, and intelligent practices. This review addresses current challenges including high costs, biosafety concerns, and scalability limitations, while providing forward-looking perspectives to guide innovative strategies for future agricultural development. The cover photo was provided by Prof. Changwen Du from Institute of Soil Science, Chinese Academy of Sciences. For more details, please see pages 1788–1812.