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REVIEW

Aptamer-functionalized MOFs and AI-driven strategies for early cancer diagnosis and therapeutics

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Abstract Metal–Organic Frameworks (MOFs) have exceptional inherent properties that make them highly suitable for diverse applications, such as catalysis, storage, optics, chemo sensing, and biomedical science and technology. Over the past decades, researchers have utilized various techniques, including solvothermal, hydrothermal, mechanochemical, electrochemical, and ultrasonic, to synthesize MOFs with tailored properties. Post-synthetic modification of linkers, nodal components, and crystallite domain size and morphology can functionalize MOFs to improve their aptamer applications. Advancements in AI and machine learning led to the development of nonporous MOFs and nanoscale MOFs for medical purposes. MOFs have exhibited promise in cancer therapy, with the successful accumulation of a photosensitizer in cancer cells representing a significant breakthrough. This perspective is focused on MOFs' use as advanced materials and systems for cancer therapy, exploring the challenging aspects and promising features of MOF-based cancer diagnosis and treatment. The paper concludes by emphasizing the potential of MOFs as a transformative technology for cancer treatment and diagnosis.

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