

Abstract

The discharge of industrial effluent containing organic dyes into natural water bodies has significantly increased, leading to significant environmental issues. Photocatalysis, a method employing Metal-Organic Frameworks (MOFs) as catalysts, presents considerable solar radiation ability to degrade dyes. A concerted effort is to enhance dye degradation efficiency by integrating MOFs with metal oxides, notably combining Zirconium Metal-Organic Framework (Zr-MOF) with Manganese Oxide (MnO_2). The resultant composite, MnO_2 -Zr-MOF, has demonstrated a marked improvement in photocatalytic activity, achieving a 98% degradation rate of MB dye within 90 minutes and maintaining 97% efficiency after four cycles. The cooperative interaction between Zr-MOF and MnO_2 nanoparticles facilitates the efficient transfer of photogenerated electrons, thereby promoting enhanced charge separation and, consequently, heightened photocatalytic efficiency. These findings underscore the composite's potential as a robust solution for remediating contaminated water resources.