Preparation of iron oxide-based porous ceramsite from goethite and application for city wastewater treatment in biological aerated filters

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\textbf{ABSTRACT}

Ceramsite is a filter medium used in biological aerated filters (BAF). We prepared iron oxide-based porous ceramsite (IPC) by calcination in an O\textsubscript{2} atmosphere with goethite, sawdust, and palygorskite clay. The properties of the IPC were analyzed by X-ray diffraction (XRD), scanning electron microscope (SEM), thermal properties (TG), X-ray fluorescence (XRF), and porosimetry. Two kinds of IPC and commercial ceramsite (CC) were used in BAFs for the treatment of city wastewater. Goethite, sawdust, and palygorskite clay were used to produce IPC that was satisfactory for city wastewater treatment. IPC BAFs had average total organic carbon, P, TN, and NH\textsubscript{3}-N removal rates of 67.92, 76.55, 43.15, and 90.71\%, respectively, much better than those of CC BAFs. The uniform pore size in IPC, with its many interconnections, made it suitable for microbial growth. IPC appears suitable for use as a BAF ceramsite for simultaneous removal of nitrogen and phosphorus from city wastewater.

\textit{Keywords:} Iron oxide-based porous ceramsite (IPC); Ceramsite; Palygorskite clay; Goethite; Biological aerated filter (BAF)

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