Analysis of a diverse bacterial community and degradation of organic compounds in a bioprocess for coking wastewater treatment

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\section*{ABSTRACT}
Coking wastewater is one of the most toxic industrial effluents since it contains high concentration of toxic organic compounds. Biological treatments are widely applied in coking wastewater treatment, pollutants can be degraded completely due to the synergistic effect of the community composition. In this study, the community structure and degradation of organic compounds of a full-scale coking wastewater treatment plant with anaerobic, anoxic, and oxic process (A\textsubscript{1}/A\textsubscript{2}/O) were studied. GC-MS results showed that phenols, indole, quinoline and pyridine, accounting for 61.70, 13.63, 7.71 and 2.30\%, respectively, were the main organic pollutants in the raw coking wastewater. Those pollutants were degraded gradually during the A\textsubscript{1}/A\textsubscript{2}/O bioprocess, respectively. High throughput pyrosequencing was applied to investigate the bacterial community, the sequences could be affiliated to 21 phylogenetic groups, including \textit{Proteobacteria}, \textit{Chloroflexi}, \textit{Bacteroidetes}, \textit{Planctomycetes}, \textit{Synergistetes}, \textit{Chlorobi}, \textit{Acidobacteria}, \textit{Nitrospira}, \textit{Firmicutes}, and \textit{Actinobacteria}. Diversity and richness indexes, venn analysis and principal component analysis indicated that the diversity and abundance of species in three samples were different. The abundance of the phylum \textit{Proteobacteria} accounted for 84.64\% (A\textsubscript{1}), 62.73\% (A\textsubscript{2}), and 83.24\% (O) of the total reads, respectively. The corresponding most dominant orders in three samples were \textit{Pseudomonadales} (A\textsubscript{1}), \textit{Syntrophobacterales} (A\textsubscript{2}), and \textit{Burkholderiales} (O), respectively. While genus \textit{Pseudomonas}, \textit{Desulfoglaeba}, and \textit{Diaphorobacter} was the dominant bacterium in three samples, respectively.

\textbf{Keywords:} Coking wastewater; Aromatic compounds; Biological degradation; Microbial community; Pyrosequencing

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