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Enhanced performance and hindered membrane fouling for the treatment of coal chemical industry wastewater using a novel membrane electro-bioreactor with intermittent direct current

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Abstract: A membrane electro-bioreactor (MEBR) embracing biological treatment, electrokinetic phenomena and membrane filtration was established by applying intermittent direct current (DC) to MBR. MEBR exhibited significant improvement of treatment performance and reduction of membrane fouling. COD and total phenols removal efficiencies increased to 83.53% and 93.28% at an exposure mode of 24'-OFF/6'-ON, compared to 71.24% and 82.43% in MBR. Trans-membrane pressure increment rate declined dramatically in MEBR, which was mainly attributed to the increase of sludge floc size and decrease of zeta potential, soluble microbial products and specific resistance to filtration, resulted from electrokinetic effects such as electrocoagulation, electrophoresis, electroosmosis and electromigration of ions. It was notable that DC exposure exerted distinct evolution on microbial community, with the improvement of microbial community richness and diversity. The relative abundances of functional genera were promoted noticeably in MEBR. An interactive relevance existed among microbial community structure, mixed liquor properties