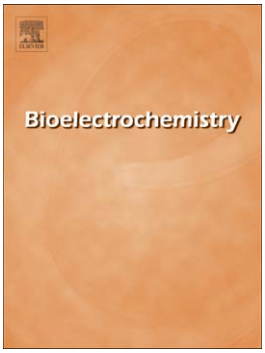

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Comparative assessment of raw and digested pig slurry treatment in bioelectrochemical systems

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ABSTRACT

Both raw and anaerobically digested pig slurries were investigated in batch assays in two chambered bioelectrochemical systems (BES) run in Microbial Fuel Cell (MFC) and Microbial Electrolysis Cell (MEC) mode. Chemical Oxygen Demand (COD) removal, nitrogen recovery, cation transport and anode microbial population evolution were assessed. The Anaerobic Digestion-MEC (AD-MEC) integrated system achieved the highest COD removal (60% in 48h); while the maximum NH_4^+ removal efficiency (40%, with an ammonia flux of 8.86 g N-NH_4^+ d^{-1} m^{-2}) was achieved in MFC mode fed with digested pig slurry in 24 h. On the other hand, the high pH (12.1) achieved in MEC mode (NaCl solution as catholyte), could favour ammonium recovery in a subsequent stripping and absorption process. Ammonia was the main cation involved in maintaining the electroneutrality between both compartments. Regarding microbial population, *Desulfuromonadaceae*, a known family of exoelectrogenic bacteria, was enriched under MEC mode, whereas hydrogenotrophic and methylotrophic methanogen phylotypes belonging to *Thermoplasmatales* were also favoured against acetotrophic *Methanosaetaceae*. From these results, the integration of anaerobic digestion in BES seems to be an interesting alternative for the treatment of complex substrates, since a polished effluent can be obtained and ammonium can be simultaneously recovered for further reuse as fertilizer.

Keywords

Bioelectrochemical systems (BES), anaerobic digestion, ammonia recovery, raw and digested pig slurry, *Desulfuromonadaceae*, system integration.