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Review

Emerging *N*-nitrosamines and *N*-nitramines from amine-based post-combustion CO_2 capture – A review

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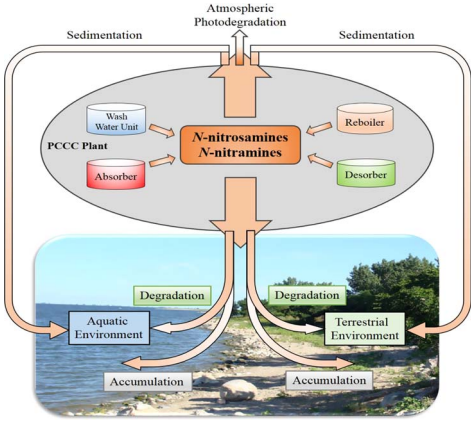
GRAPHICAL ABSTRACT



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ABSTRACT

Amine-based post-combustion CO_2 capture (PCCC) technology is regarded as one of the most viable solutions for the mitigation of CO_2 emissions. It has been mature enough to be implemented on commercial scales. However, *N*-nitrosamines and *N*-nitramines can be formed as by-products of amine degradation during PCCC processes. They are suspected carcinogens and strictly regulated. With the development of PCCC technology across the global, PCCC facility may become a main source of *N*-nitrosamines and *N*-nitramines to the environment. Due to the possible adverse effects of *N*-nitrosamines and *N*-nitramines on the environment and human health, the interests in the occurrence, fate and mitigation of PCCC-derived *N*-nitrosamines and *N*-nitramines have been shared by a growing number of researchers recently. Therefore, this article provides a comprehensive review on

Abbreviations: AMP, 2-amino-2-methyl-1-propanol; AMP-NO_2, 2-methyl-2-(nitroamino)-1-propanol; AOPs, Advanced oxidation processes; CHO, Chinese hamster ovary; DEA, Diethanolamine; DEELA, 2-(diethylamino)ethanol; DMA, Dimethylamine; DMA-NO_2, Dimethylnitramine; DMELA, 2-(dimethylamino)ethanol; DMNO, *N*-nitrodimethylamine; EDELA, *N*-ethyldiethanolamine; EOR, Enhanced oil recovery; FT-ICR/MS, Fourier transform ion cyclotron resonance mass spectrometer; GHS, Globally Harmonized System; Gly, Glycine; GC-MS, Gas chromatography-mass spectrometer; GC-MS-TOF, Gas chromatography-mass spectrometer-time of flight mass spectrometry; HEEDA, *N*-(2-hydroxyethyl)ethylenediamine; HeGly, *N*-(2-hydroxyethyl)glycine; HPLC, High Performance Liquid Chromatography; LC-MS, Liquid chromatograph-mass spectrometer; LC-MS/MS, Liquid chromatography-tandem mass spectrometry; LLE, Liquid-liquid extraction; MA-NO_2, *N*-nitromethanamine; MDEA, Methyldiethanolamine; MEA, Monoethanolamine; MEA-NO_2, Ethanolnitramine; MMA, Monomethylamine; MMEA, Methylethanolamine; MNPZ, *N*-nitrosopiperazine; MOR, Morpholine; NDEA, *N*-nitrosodiethylamine; NDELA, *N*-nitrosodiethanolamine; NDMA, N-nitrosodimethylamine; NHeGly, *N*-nitroso-(2-hydroxyethyl) glycine; NMO, *N*-nitromorpholine; NOM, Natural organic matter; NPIP, *N*-nitrosopiperidine; NPZ, *N*-nitropiperazine; NSMO, *N*-nitrosomorpholine; PCCC, Post-combustion CO_2 capture; PZ, Piperazine; SPE, Solid-phase extraction; TEA, Triethylamine; TELA, Triethanolamine; TONO, Total *N*-nitrosamines; TRIS, Tris(hydroxymethyl)aminomethane; UV, Ultraviolet

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