Thesis title: Development of a novel catalytic membrane reactor: application in wastewater treatment

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Chemical oxidation processes are the most universal tool for treatment of contaminated groundwater, industrial effluents and wastewater. Oxidation at mild conditions and based on the generation of highly reactive hydroxyl radicals (•OH) is referred to as advanced oxidation process (AOP). Even though this technique is considered as powerful regarding contaminant degradation, it faces several practical limitations in a large scale due to the cost of the system selected for •OH generation.

The aim was to propose and test a novel strategy in order to extend the applicability of AOP, whereby the integration of catalytic membrane reactors (CMRs) plays a key role. The efforts were focused on the application of the CMRs for direct oxidation of a model organic compound by the in-situ generated hydrogen peroxide. The inherent properties of the CMRs permit the direct synthesis of hydrogen peroxide starting from H₂ and O₂ using noble metal as an active phase.