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Novel Process for the exergetically efficient recycling of chlorine by gas phase electrolysis of hydrogen chloride

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Abstract

Due to the steadily increasing production capacities of polycarbonates and polyurethanes, the volume of hydrogen chloride (HCl), which emerges as byproduct from these processes, is experiencing a significant growth. Owing to the oversaturation of the market for HCl and hydrochloric acid, the question on how to utilize this byproduct in a sustainable and energy-efficient way is becoming more and more important. The oxidation of HCl to chlorine, which can be redirected as an educt to these above mentioned processes, offers a feasible solution to this problem and can be carried out either heterogeneously catalyzed at high temperatures or through electrolysis. Up to now, the most energy-efficient industrially employed electrochemical variant is the Bayer UHDENORA process, based on aqueous hydrochloric acid as a feed stock. The major objective of this work is to propose a novel electrochemical process utilizing HCl as a gaseous reactor feed in order to significantly reduce the electrical energy demand of the reactor combined with new and more energy-efficient subsequent separation sequences. For this purpose, flowsheet simulations of the Bayer UHDENORA process and two novel process variants based on the gas phase reactor and two different separation sequences were carried out

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