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ABSTRACT

"Development of technological assumptions for the crystallization of ammonium metavanadate from waste containing ammonium nitrate"

The dissertation is divided into two parts. The first is the theoretical part in which the characteristics of sodium carbonate and its production volume by country and method are briefly introduced. The next two chapters discuss the first, historically important Leblanc method, followed by a presentation of the most widespread Solvay method, with particular emphasis on environmental aspects. The next chapter is a brief overview of waste-free sodium carbonate production methods. The chapter includes methods used on an industrial scale, as well as the various concepts of zero-waste methods for soda production. The last pro-environmental method discussed is the SCS method, which has its advocates among the 72 experts participating in the Delphi study conducted as part of the project led „Odpady nieorganiczne przemysłu chemicznego – foresight technologiczny", the final report of which was published in 2012. The method envisages the creation of a combine producing chlorine, soda and mixed saltpeter simultaneously. Unfortunately, due to the content of unconverted sodium chloride in the filtration liquor at about 2% by weight, on a dry weight basis, there is a real danger of uncontrolled decomposition of the mixed saltpeter obtained during the concentration, crystallisation, storage or transport stages. One possible solution is the conversion of ammonium nitrate to ammonium metavanadate by double exchange using potassium metavanadate. The reagents, apparatus and analytical methods used started the second part of the work, the experimental part. The results of studies on the ternary systems $KNO_3 + KVO_3 + H_2O$ and $NH_4NO_3 + KNO_3 + H_2O$ in the temperature range 293,15-323,15K were then presented to determine the concentration of the individual salts at eutonic points. The data obtained enabled studies on the five-component system $NH_4NO_3 + KVO_3 + NH_4VO_3 + KNO_3 + H_2O$ in the same temperature range. The experimental data obtained, tabulated, allowed the plotting of diagonal projections on the plane according to Jänecke and the determination of the maximum conversion degrees for the temperature range studied. Finally, the results of the material balance calculations are presented graphically, and the entire study is summarised in conclusions.