

ABSTRACT

The paper presents the concept of utilization of post-production waste limestone stored in landfills, by restoring its properties and reusing it in the economy. The tool to improve the properties of the waste was an electromagnetic mill developed at Czestochowa University of Technology. The mill was modified so as to adapt it to hydrated products, which was the assumed material. The waste came from the industrial process of chlorohydrin saponification and was originally calcium hydroxide. After the trial, it was sent to a landfill. The concept was based on electromagnetic activation and then using the material prepared in this way in wet flue gas desulfurization. As a result of the secondary use of activated waste, we obtain, a reduction of sulphur oxides, after the desulfurization process, we obtain gypsum, as a fully marketable product. Samples of waste from three landfills at several depths were collected for the study and subjected to a comprehensive physicochemical analysis. The samples were found to be highly agglomerated and show low reactivity, moreover secondary carbonization occurred in landfills. The samples were further activated and their physicochemical properties were determined again, including their sorption reactivity towards sulphur oxides. The results confirmed the agglomeration, the increase in the specific surface area, the reduction of grain diameter and the increase reactivity compare to the level of pure calcium hydroxide, of course, in selected process configurations. As a result of the research, the basic parameters for the modification of the mill were determined, the most advantageous variants were selected, and an industrial test was carried out. In this test, background measurements and a test with activated lime milk were performed, confirming at the same time the validity of the selected concept. The activated waste can fully replace calcium hydroxide-based milk of lime without reducing the artificiality of the flue gas desulfurization process. Also, the results of the obtained post-process gypsum confirmed its economic usefulness. Therefore, the work fits into the concept of a circular economy, showing the potential and real possibilities of using waste in the economy.