

Odor Removal Technology using Aluminum Dross

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[Abstract]

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Annually, tens of thousand tons of aluminum dross, an industrial waste generated during the aluminum production process, is generated. However, recycling and disposal of aluminum dross is extremely difficult due to foul odor and risk of ignition brought about by the reaction between AlN and metallic aluminum in the dross with water to form ammonia (NH₃) and hydrogen (H₂) gas. This study investigated hydro-processing of dross to intentionally react dross and water, however the process was found impractical due to the production of large quantities of liquid waste. Therefore, in this study, to significantly reduce liquid waste generation, cyclic use of the generated liquid waste to treat aluminum dross was investigated. About 45 g of dross was placed in 450 ml of ultra-pure water at 50 °C and treated by injecting O₃-containing gas (1 L/min) for 24 hours. After treatment, the solution was filtered, and the filtrate reused to treat a new batch of untreated aluminum dross. It was found that regardless of the treatment cycle, generation of NH₃ gas was confirmed indicating that the cyclic use of the generated liquid waste is an effective means to treat aluminum dross while significantly reducing liquid waste generation.

Nitrides and metals in Al dross can be converted to aluminum hydroxide by hydro-processing. But there is no method for effective utilization of the solid residue. In this study, we focused on the ability of aluminum hydroxide (Al(OH)₃) to remove hydrogen sulfide (H₂S) as an effective way to utilize hydro processed dross. Therefore, a fundamental study on H₂S removal experiment using reagents corresponding to hydro processed dross and its composition phases was conducted. It was found that Al(OH)₃, which is the phase present in the hydro processed dross, has the ability to remove H₂S with the presence of oxygen, and H₂S can be removed as S₈. It was also confirmed that hydro processed dross has almost the same performance as commercial H₂S remover.

[References]