

The Use of Gypsum and Waste Gypsum for Electrical Grounding Backfill

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Abstract:

Large quantities of gypsum arise from the production of titanium dioxide and from construction waste plasterboard. Due to strict legislation, alternative applications for both gypsum are desperately required. Gypsum-based compounds have been shown to improve the electrical conductivity of materials. In this study, both red gypsum and plasterboard gypsum were investigated for the use as grounding enhancement backfill material. The current investigation undertaken aimed to develop gypsum-based grounding enhancement material that has low resistivity. Tests included determination of geotechnical properties, plasticity characteristics and the electrical resistivity corresponding to different state and water content. Test results showed that, the geotechnical properties of RG vary to that of white gypsum. RG is classified as extremely high plastic whereas gypsum is classified as high plastic. The plasticity index (PI) of RG was found to be 240% greater due to surplus Fe ions. When mixed with water, both material can exist in four different state, ranging from solid, semi-solid, plastic and liquid. Surprisingly, the electrical resistivity of gypsum is lower under wet conditions irrespective of the state. However for long-term and from practical perspective, RG is a better material for grounding purposes as the plasticity of gypsum was found to be short lived and hardened instantaneously due to exothermic reaction. Once hardened, the gypsum resistivity behaviour behave similar to its dry state.

Keywords: Gypsum; Titanium Dioxide; Red Gypsum; Plasticity; Grounding; Electrical Resistivity

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