

## Characterization of raw materials and final product in the cement production

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**Abstract:** Cement is a hydraulic binder formed by the grinding process of cement clinker, as intermediate product, which is produced by baking the lime-clay raw material mixture to the sintering temperature. This research paper describes mineralogical analysis technique of primary raw materials, auxiliary components for cement production, by-product clinker and final product, cement. Used technique is X-ray diffraction technique, which is one of the most modern instrumental techniques today. Obtained results are provided in the form of diffractogram, that is used to display the mineralogical phase of components. X-ray diffraction method confirmed the theoretical knowledge of the mineralogical components of tested raw materials, clinker and cement. As expected, the main component of limestone is mineral calcite, as active compound, fly ash and slag as amorphous substances and clinker contains clinker-minerals and gypsum contains calcium sulfate dihydrate in large percentage. Main components of cement are all minerals provided in clinker and raw materials. These experiments were carried out in the Holding Company Cement Plant in Lukavac, Bosnia and Herzegovina.

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## INTRODUCTION

The raw materials for cement production include raw materials of carbonate character and raw material of acid character. Corrective raw materials include corrective raw materials of silicate character and corrective raw materials with high content of iron oxide.

The basic raw materials for cement production are limestone and clay. The limestone represents the dominant component, most often 75%, clay and corrective raw materials remaining 25% of the raw blend (Kostić-Gvozdenović et al., 1987). Contrary to artificially prepared raw materials, natural material containing 65-75% limestone ( $\text{CaCO}_3$ ) and 25% clay without corrective properties (Brzaković, 2000). The limestone is a sedimentary rock composed of calcite

minerals ( $\text{CaCO}_3$ ), but also contains chemical admixtures of iron, manganese, magnesium, clay, hydrargylite, sand, organic matter, etc. (Brzaković, 2000). In addition to calcite in limestone, mineral aragonite, also calcium carbonate ( $\text{CaCO}_3$ ), which crystallizes rhombically, can be found (Brzaković, 2000). Dolomite ( $\text{MgCO}_3 \cdot \text{CaCO}_3$ ) can be found in limestone rocks (Brzaković, 2000). Some studies had shown that substitution of zeolite require less amount of clinker, which results in production growth and energy savings. Therefore it reduces air pollution with decreasing the  $\text{CO}_2$  emission and other gases as well (Canpolat et al, 2004).

Marlstone is a sedimentary rock, which is built of clay particles and calcium carbonate or dolomite (Hamzabegović, 2015). The clay content ranges from