Microstructure of Carbonation Cured Calcium-Carrying Materials

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To investigate the feasibility of sequestering carbon dioxide in the production of calcium silicate building products, the carbonation behavior of six cementitious materials was examined: CSA Type 10 and Type 30 cements, fly ash, blast furnace slag, electric arc furnace slag and hydrated lime. No-slump press formed compacts and loose powders were subjected to 100% CO_2 at a pressure of 5 bar for 2 hours. The CO_2 contents were determined by mass gain and infrared carbon analyzer. Carbonation products were examined through XRD and SEM. Crystalline calcite was found to be the dominant product; according to XRD, it formed due to reaction of C_3S, C_2S and CH. SEM observations related microstructural characteristics and carbonation product morphology to the uptake and strength development. A fused acicular or flaky calcite coating on the particles was associated with higher strength and uptake; looser and non-fused arrangements were associated with lower uptake and strength.