Abstract

The objective was to evaluate the progression of natural carbonation by measuring the degree of carbonation in corrugated fiber cement roofing sheets produced by Eternit S.A. in Colombo, Paraná, Brazil. Natural carbonation was assessed by directly exposing the corrugated sheets to the natural environment for a period of up to 360 days. Samples were collected and separated from different layers of the sheets (upper, inner and down face). Thermogravimetric analysis (TGA) and X-ray diffraction (XRD) data were analyzed to determine the degree of carbonation. TGA results after 360 days showed that the $CaCO_3$ content increased to 27.53% in the down, 28.57% in the inner, and 29.55% in the upper face relative to the reference (day zero). After 360 days, the degree of carbonation increase was calculated as being equal to 60% in the down, 55% in the inner, and 62% in the upper face (relative to the reference). When comparing the different regions of the sheet, the upper and down faces exhibited the highest degrees of carbonation up to 270 days. XRD results show an increase in peaks associated with the calcite phase (28° 2θ) as exposure time increased, a trend linked to the carbonation process. Carbonation in the corrugated sheets progresses gradually through the material over time, with the process occurring more slowly in the inner than at the sheet's surfaces. Over 360 days, the corrugated roofing sheets incorporated approximately 2.84 kg of CO2 per m^2 of covered area and 187 kg of CO2 per ton of fiber cement.