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Characterization of the Corn Cob to Know Its Potential as a Source of Biosilica to Be Used in Sustainable Cementitious Mixtures

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Abstract : The major challenge for industries that rely on fossil fuels in manufacturing processes or to provide goods and services is to lower their CO2 emissions, as the case for the manufacture of Portland cement. Feasible materials for this purpose can include agro-industrial or agricultural wastes, which are termed 'biosilica' since the silica was contained in a biological matrix (biomass). Corn cob (CC) has some characteristics that make it a good candidate as biosilica source: 1) it is an abundant grain crop produced around the world; 2) more production means more available residues is left in the field to be used. This work aims to evaluate the CC collected from different farms in Canada during the corn harvest in order to see if they can be used together as a biosilica source. The characterization of the raw CC was made in the physical, chemical, and thermal way. The moisture content, the granulometry, and the morphology were also analyzed. The ash content measured was 2,1%. The Thermogravimetric Analysis (TGA) and its Derivative (DTG) evaluated of CC as a function of weight loss with temperature variation ranging between 30°C and 800°C in an atmosphere of N2. The chemical composition and the presence of silica revealed that the different sources of the CC do not interfere in its basic chemical composition, which means that this kind of waste can be used together as a source of biosilica no matter where they come from. Then, this biosilica can partially replace the cement Portland making sustainable cementitious mixtures and contributing to reduce the CO2 emissions.

Keywords : biosilica, characterization, corn cob, sustainable cementitious materials
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