

More environmentally-friendly concrete made using sugar cane residue

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Researchers from the Universitat Politècnica de València (Polytechnic University of Valencia, UPV) and San Paolo State University (Unesp) have developed a new type of concrete that is cheaper and much less polluting to the environment. They have done so by swapping in sugar cane straw ash, a crop residue typically discarded as waste, as a substitute for Portland cement.

Currently pursued at laboratory scale only, the results of this work have been published in the Construction and Building Materials journal. They also form part of Brazilian student João Cláudio Bassan de Moraes's master's dissertation, directed by lecturer Mauro Tashima, who completed his PhD at the UPV and is currently lecturing at Unesp.

Talking to us about the project, Jordi Payá, researcher at the Concrete Science and Technology Institute (ICITECH) at the UPV, explains: "The harvester strips the cane, discarding the tops and leaves as waste. This is the raw material we work with, sugar cane straw". In total around 650 million tonnes of sugar cane are harvested in Brazil every year. Of this, between 15 and 20% corresponds to sugar straw, which is left on the field and either burned or left to decay naturally.

So far, the international research team has been able to obtain concrete using 30% less Portland cement, substituting it with the ashes obtained from burning the [sugar cane](#) straw.

"The cement itself is the most expensive and most polluting ingredient of

concrete, which makes the benefits [of this new method] as much economic as environmental. We are also making use of a by-product that is currently unexploited, with all the benefits that this entails."

Process

To burn the waste, UPV and Unesp researchers have designed a bespoke combustion burner, into which the raw material must be fed following a strict procedure. "Through this process we obtain ashes that are very reactive to the cement, a quality that is very important to the mechanical performance of the resulting concrete, to its resistance to compression, for instance" (Payá).

Work has focused primarily on the microstructural analysis of the concrete. "In the lab we analyse the chemical compounds of the ashes and of the compounds produced during the reaction with the cement, in order to assess their performance in the final product", explains Payá. Future work would include studying indicators related to the durability of mass and reinforced [concrete](#).

The ICITECH research team also studies the use of other agricultural waste as a [cement](#) substitute, including the bamboo leaf.

More information: J.C.B. Moraes et al. Assessment of sugar cane straw ash (SCSA) as pozzolanic material in blended Portland cement: Microstructural characterization of pastes and mechanical strength of mortars, *Construction and Building Materials* (2015). [DOI: 10.1016/j.conbuildmat.2015.07.108](#)

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