Etude de l'utilisation d'anas de lin pour réduire les effets de la dessication et de la fissuration dus aux retraits des bétons horizontaux au jeune âge

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Abstract

This thesis focuses on the innovative use of flax shives as an additive for concrete in the construction sector, with a particular emphasis on improving the reduction of surface cracking in horizontal structures subjected to high evaporation. At the core of this research is the analysis of the physical and ecological properties of flax shives, a by-product of the flax industry, primarily produced in the north-western quarter of France as well as in Belgium and the Netherlands. The interest in flax shives lies in their potential to offer a sustainable and effective alternative to traditional concrete components, contributing to the reduction of drying shrinkage and cracking, major issues for the quality and durability of concrete structures. The study is part of a CIFRE collaboration between Builders Ecole d'Ingénieurs, the University of Caen, and VINCI Construction, a global leader in the sector, highlighting an approach of open innovation and applied research. The results demonstrate that the incorporation of flax shives in concrete significantly contributes to the reduction of cracking and shrinkage, without compromising essential mechanical properties such as compressive strength. However, the addition of flax shives to concrete also reveals challenges, particularly in terms of adjusting formulations to maintain adequate consistency and optimal management of hydration and shrinkage. The study highlights that the benefits of flax shives, integrated at a rate of 4 kg/m3 of concrete, are primarily mechanical, acting as a reinforcement that limits crack opening, rather than through substantial modification of hydration and shrinkage processes. The conclusion of this thesis marks a step forward in the research of sustainable construction materials and highlights the potential for valorizing flax shives to improve the performance and environmental impact of concrete structures.