

Lignin-based concrete plasticizer technology LigniOx to be scaled-up

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Using the LigniOx technology, developed by VTT (Technical Research Centre of Finland), lignin by-products from pulp mills and other biorefineries are converted into concrete plasticizers. These can compete with the synthetic and lignosulphonate-based admixtures on the market. The technology will be scaled-up, and the lignin-based concrete admixtures will be developed with industrial partners in the LigniOx project. This is a Bio-Based Industries Joint Undertaking project operating under the Horizon 2020. VITO participates in LigniOx as a research partner.

Cooperation enables the commercial-scale production and market entry of first products within a few years. Although plasticizers account for less than one percent of concrete, their global market is huge, approximately 10 million tons per year. In addition to concrete plasticizer, LigniOx lignins can also be used as dispersing additives, e.g. in paints, coatings, and in the manufacture of gypsum products.

Improved product quality

Concrete is the most used construction material, and good workability of fresh concrete must be ensured without compromising the strength of matured concrete. The LigniOx plasticizers enable the use of a small amount of water, producing a highly workable concrete that hardens into a strong final product. In fresh concrete, the LigniOx lignin works noticeably better than a commercial lignosulphonate-based plasticizer and even competes with some of the synthetic superplasticizers. The lignin oxidation process is easy to integrate into existing biorefineries owing to compatible and safe bulk chemicals.

International project team

The participants in the LigniOx project are: VTT (project coordinator), VITO (Belgium), Metsä Fibre (Finland), Andritz (Finland), St1 (Finland), CIMV (France), Biochemtex (Italy), Dow (Germany), Vertech Group (France), and Exergy (United Kingdom). VTT will further develop its technology together with a machine supplier, a pulping company, bioethanol producers, and a chemical company

As part of the project, a mobile pilot unit will be constructed, the process technology will be scaled-up, and demonstrated at the biorefineries using various technical lignins. First, LigniOx-based concrete plasticizer admixtures will be formulated, and their performance will be demonstrated in field tests. After the project, the techno-economically viable and environmentally friendly lignin upgrading technology will be ready for installations of commercial scale. New sustainable and cost-competitive lignin-based, high-performance concrete plasticizers will enter the market soon after that.

VITO's contribution

VITO is responsible for post-treatment of the oxidized lignin using cross-flow membrane filtration, more specifically ultra/nanofiltration. This is essential for the techno-economic success of the overall concept as it offers a means to simultaneously concentrate and purify the product, thereby improving its plasticization properties, while enabling recycling of the process chemicals. The membrane processes developed, directly integrated with the lignin oxidation, will be demonstrated through longer term pilot trials at several pulp mills and biorefineries.

Total budget of the 4 year-long LigniOx project is EUR 5.6 Million. The Bio-Based Industries Joint Undertaking is a EUR 3.7 billion Public-Private Partnership Operating under Horizon 2020, and it is driven by the Vision and Strategic Innovation and Research Agenda (SIRA) developed by the industry. The project has received funding from the Bio-Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No 745246.

LigniOx project (Lignin oxidation technology for versatile dispersants): <http://www.ligniox.eu/>

Bio-Based Industries Joint Undertaking: www.bbi-europe.eu/projects/ligniox

More information

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