

Fields of use

Food industry.
Pharmaceutical, cosmetics
industry.

Current state of technology

Technology confirmed in
the laboratory (TRL 4)

Intellectual property

Patent application

Developed by

University of Ljubljana,
Faculty of Chemistry and
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Reference

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Background

Lignin is a source of many useful chemicals, such as vanillin, vanillic acid, phenol, etc. More than 50 million tonnes of lignin are produced per year, but only 2% is used for industrial purposes. Vanillin is widely used in pharmaceuticals, for flavoring food, as a food preservative, and as a fragrance in cosmetics. As the vanillin market is estimated to be worth more than € 100 billion, many researchers are paying close attention to discovering a green and environmentally friendly processes for the synthesis of vanillin from lignin or ferulic acid.

Description of the invention and Main advantages

The innovation represents the conversion of lignin and ferulic acid into vanillin using hydrogen peroxide as an oxidant and vanadium oxide as a catalyst. Key advantages of the innovative process:

- Hydrogen peroxide is used as an oxidant, leaving water as a by-product.
- Vanadium (V) oxide, a cost-effective chemical that does not require additional ligands, is used as a catalyst; thus making the process cheaper than competitive solutions.
- Vanillin is produced selectively. In the oxidative degradation of lignin, three aromatic aldehydes are formed. In our process, the other two aldehydes are converted further and this results in selective formation of vanillin. The process can be modified to convert to other products, e.g. vanillic acid.

The advantage of selectivity: at the end of the process it is not necessary to separate the formed aldehydes from each other, which would significantly increase the cost. Improvements also apply to ferulic acid, which is a product of biomass, usually isolated after microbiological degradation of lignin.

