

**FORMIC ACID PRETREATMENT OF LIGNIN TO FACILITATE THE
DEPOLYMERIZATION OF LIGNIN BY LACCASE FROM *TRAMETES*
*VERSICOLOR***

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ABSTRACT

This article presents an exhaustive review of these studies and suggests a direction for future developments. The utilization of lignin for production of molecular aromatic chemicals has become an effective alternative way instead of using petroleum. An experimental investigation was conducted to study the effect of formic acid on the pretreatment of lignin from palm oil empty fruit bunch (POEFB) by varies the reaction time and explore the effect of formic acid pretreatment on lignin depolymerization by laccase from *Trametes versicolor* (LTV). 100 ml of formic acid solution with 0.2M H₂SO₄ as a catalyst was used to pretreat lignin from POEFB at different residence times. Laccase assay was determined based on 2,2'-azinobis-(3-ethylbenzothiazoline-6-sulphonic acid) (ABTS) concentration. The depolymerization of lignin was conducted by using lignin from POEFB depolymerize by LTV and mediated by ABTS. The products were separated by fractionation method and had been analyzed by using High Performance Liquid Chromatography (HPLC). The LTV activity demonstrates the higher performance when the concentration of ABTS was 1.0 mM. As the concentration of ABTS increase, the rate of reaction of LTV was also increase. Vanillin was expected to be produced at the end of the research, however by comparing the average retention time of vanillin with samples, the peak observed was not representing the vanillin. On the other hand, the peak was representing unknown chemical compound.

ABSTRAK

Artikel ini membentangkan kajian menyeluruh dan mencadangkan hala tuju pembangunan masa depan. Penggunaan lignin dalam pengeluaran bahan kimia aromatik telah menjadi salah satu jalan alternatif selain menggunakan petroleum. Satu uji kaji telah dijalankan untuk mengkaji kesan asid formik dalam pra-rawatan lignin dari buah kelapa sawit kosong dengan memanipulasi masa dan mengkaji kesan asid formik dalam penyahpolimeran lignin dengan menggunakan laccase dari *Trametes versicolor* (LTV). 200 ml larutan asid formic dan 0.2 M asid sulfurik yang bertindak sebagai pemangkin telah digunakan untuk merawat lignin pada tempoh masa yg berbeza. Aktiviti laccase telah ditentukan dengan memanipulasi kepekatan 2,2'-azinobis-(3-ethylbenzothiazoline-6-sulphonic acid) (ABTS). Penyahpolimeran lignin telah dijalankan dengan menggunakan lignin dari buah kelapa sawit kosong, laccase dari *Trametes versicolor* dan ABTS. Produk yang terhasil telah dianalisis dengan menggunakan high performance liquid chromatography (HPLC). Aktiviti LTV menunjukkan prestasi yang lebih tinggi apabila kepekatan ABTS adalah 1.0 mM. Apabila kepekatan ABTS meningkat, kadar tindak balas LTV juga telah meningkat. Vanillin dijangkakan terhasil pada akhir kajian, walau bagaimanapun dengan membandingkan masa tahanan purata vanillin dengan sampel, puncak yang terhasil tidak mewakili vanillin. Sebaliknya, puncak itu mewakili sebatian kimia yang tidak diketahui.