# Radical polymerization of styrene catalyzed by manganese peroxidase (MnP)

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Manganese peroxidase (MnP) secreted from the white-rot fungus *Phanerochate chrysporium* is a lignin-degrading enzyme. Styrene was polymerized to give polystyrene using MnP and Manganese (Ⅲ) acetate and conducted by miniemulsion polymerization. In the polymerization using the Manganese(Ⅲ) acetate, the polymer yield was increased while the concentration of 2,4-pentanedione as initiator was increased to 8mM and decreased while the concentration of initiator was from 12mM to 72mM. Additionally, $^{1}$H-NMR and $^{13}$C-NMR spectras revealed that predominately atatic polymer was formed. The glass transition temperature (Tg) was estimated to be 103℃ by DSC. The polymerization of polystyrene synthesized by MnP was started by adding the $H_2O_2$. The yield of polystyrene synthesized by MnP was increased from 34.74% to 44.88% when the concentration of $MnSO_4$ decreased from 4mM to 1mM, respectively. Additionally, The morphology and thermal stability were also similar to polystyrene synthesized by Manganese(Ⅲ) acetate. The styrene polymerization reactions reported here are carried out at room temperature via a mild enzymatic modification process.