

Hydrogen peroxide degradation by immobilized cells of alkaliphilic *Bacillus halodurans*

Abstract:

Whole cells of *Bacillus halodurans* LBK 261 were used as a source of catalase for degradation of hydrogen peroxide. The organism, *B. halodurans* grown at 55°C and pH 10, yielded a maximum catalase activity of 275 U g⁻¹ (wet wt.) cells. The catalase in the whole cells was active over a broad range of pH with a maximum at pH 8–9. The enzyme was optimally active at 55°C, but had low stability above 40°C. The whole cell biocatalyst exhibited a K_m of 6.6 mM for H₂O₂ and V_{max} of 707 mM H₂O₂ min⁻¹ g⁻¹ wet wt. cells, and showed saturation kinetics at 50 mM H₂O₂. The cells were entrapped in calcium alginate and used for H₂O₂ degradation at pH 9 in batch and continuous mode. In the batch process, the immobilized preparation containing 1.5 g (wet wt.) cells could be recycled at least four times for complete degradation of the peroxide in 50 mL solution at 25°C. An excess of immobilized biocatalyst could be used in a continuous stirred tank reactor for an average of 9 days at temperatures upto 55°C, and in a packed bed reactor (PBR) for 5 days before the beads started to deform.