

## COMBINED USE OF ULTRASOUND AND COMPRESSED LIQUEFIED PETROLEUM GAS TO INCREASE THE ACTIVITY OF ENZYMES

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This work is focused on the evaluation of the effects of treatment with pressurized liquefied petroleum gas (LPG) and pressurized LPG combined with ultrasound on the activity of cellulase and xylanase. It was evaluated the effects of temperature, pressure and exposure time on the enzyme activities treated with pressurized LPG or under simultaneous action of pressurized LPG and ultrasound. The experiments were performed in a laboratory-scale unit, which consists basically of a solvent reservoir, a thermostatic bath, an ultrasonic bath equipped with a transducer having longitudinal vibrations, operating frequency of 40 kHz and a maximum rated power output of 154 W, a syringe pump, a stainless steel vessel with an internal volume of 3 mL, an absolute pressure transducer equipped with a portable programmer. Results showed that treatment with compressed LPG increased the catalytic power of both enzymes. Comparing the gain/loss of activity obtained in the two systems it was demonstrated that, with few exceptions, the activity gain was higher when the combined treatment technique, compressed LPG and ultrasound, was employed, with the highest activity gain observed of about 350% and 250% for cellulase and xylanase, respectively. In this sense, the use of pressurized LPG combined with ultrasound showed to be a promising procedure to be applied industrially to improve the activity of enzymes, increasing the efficiency of hydrolysis of lignocellulosic materials.

**Keywords:** Cellulase, xylanase, liquefied petroleum gas, ultrasound, high-pressure.

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