Alcohol Fermentation Monitoring using Near Infrared Spectroscopy: A detailed Overview on Extracellular Metabolites

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The complexity and difficulties on controlling/monitoring bioprocesses, such as; alcohol fermentation processes, are well known. Near-infrared (NIR) spectroscopy is a trend in biotechnology and other industrial fields for its efficiency and simplicity. The use of NIR spectroscopy gives an immediate and detailed analysis with no sample preparation. The aim of this study is to prepare a calibration model to measure direct and completely non-modified off-line samples taken from fermentation broth. The following extra-cellular metabolites are analyzed: glucose, ethanol, glycerol, acetate, succinate and pyruvate. The models are built in a combination of PLS/PCA (Partial Least Squared/Principal Component Analysis). Our previous studies confirmed the possibility of monitoring biomass, glucose, alcohol and glycerol. Partial results show that PLS/PCA provides calibration models with correlation coefficients higher then 0,95. Possibilities are promising and future studies for online measurements and testing with different culture mediums are undergoing expansion.

Keywors: fermentation, Saccharomyces cerevisiae, alcohol, biofuel, near infrared.