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(54) **Title:** IN SITU RAMAN SPECTROSCOPY SYSTEMS AND METHODS FOR CONTROLLING PROCESS VARIABLES IN CELL CULTURES

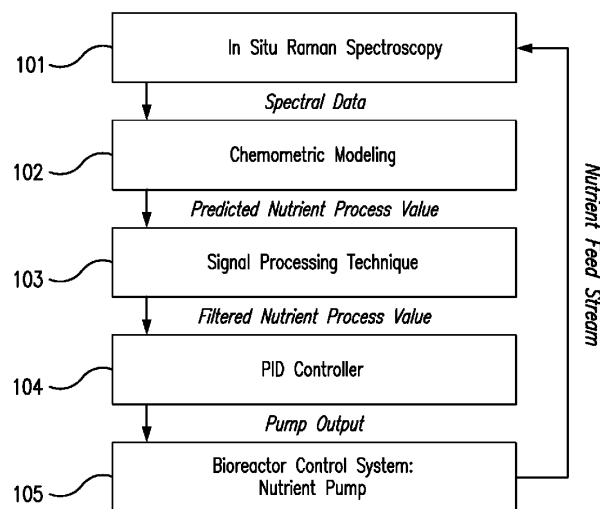


FIG. 1

(57) **Abstract:** The present invention provides *in situ* Raman spectroscopy methods and systems for monitoring and controlling one or more process variables in a bioreactor cell culture in order to improve product quality and consistency. The methods and systems utilize *in situ* Raman spectroscopy and chemometric modeling techniques for real-time assessments of cell cultures, combined with signal processing techniques, for precise continuous feedback and model predictive control of cell culture process variables. Through the use of real-time data from Raman spectroscopy, the process variables within the cell culture may be continuously or intermittently monitored and automated feedback controllers maintain the process variables at predetermined set points or maintain a specific feeding protocol that delivers variable amounts of agents to the bioreactor to maximize bioproduct quality.

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SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN,  
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