Towards the understanding of transient dynamic phenomena of different time scales observed in dedicated experiments for biokinetic characterisation of microbial populations.

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In many biokinetic studies batch experiments are conducted to obtain quantitative information on the behaviour of bioprocesses. This information is subsequently summarised in mathematical models and used to increase basic process understanding, for process design or the for setting up control strategies.

Results of dynamic phenomena measured in a batchwise operated respirometer are presented and classified into 3 main categories characterised by their time constants :

All measured Oxygen Uptake Rate (OUR)-profiles show a one-to-three minute 'start-up' phase upon substrate addition. To explain this fast dynamic process the DO-electrode dynamics, the mixing characteristics in the respirometer and the extracellular transport limitations were studied. None of these explanations were found adequate and it is hypothesised that intracellular transport and conversion processes are responsible for the transient response.
At the level of transients with a time constant in the order of 10 minutes, respirometric results are given that can be explained by the dynamics of regulation processes like enzyme activation or m-RNA control of enzyme synthesis.
Finally, for the slowest dynamics the adaptation of a mixed culture population to changed operating conditions is demonstrated.