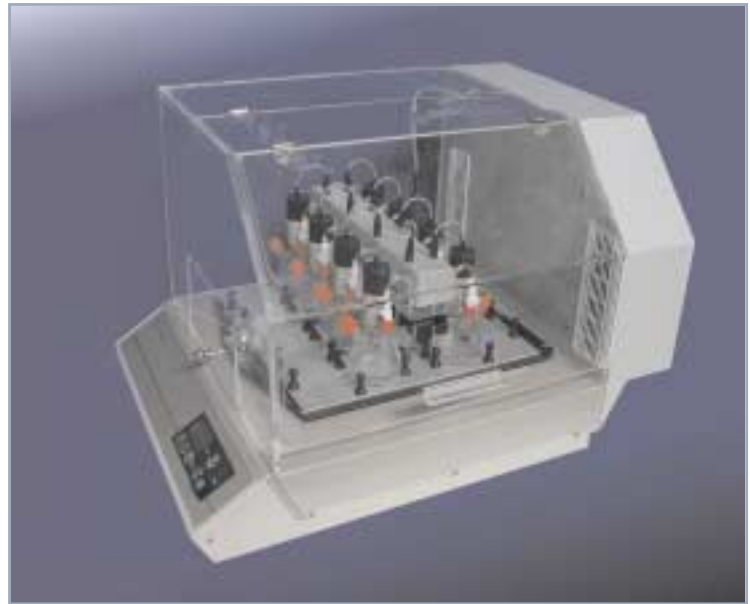


# RAMOS (Respiration Activity Monitoring System)

## RAMOS

RAMOS determines the oxygen transfer rate (OTR), the carbon dioxide transfer rate (CTR) and the respiratory quotient (RQ) of microbial, plantal and cell cultures online. The respiration rates (OTR, CTR) are the most suitable measurable variables to quantify the physiological state of fermented cultures.

RAMOS is the right tool to meet the PAT initiative of the FDA regarding shaken bioreactors.



## Advantages

- + 8 parallel fermentations
- + very easy handling (set up as fast and easy as a normal shake flask)
- + one system for animal/human, microbial and plantal cells
- + automated system
- + non stop applicable (short set-up time)
- + substitution of expensive fermentations in stirred bioreactors
- + optimisation of screening conditions in shaken bioreactors
- + more information about your cultures in shaken bioreactors
- + rapid optimisation of media
- + ensuring a secure scale-up by providing important values (OTR, CTR, RQ,  $\mu_{max}$ , ...)
- + reduction of the optimisation time and "time to market"
- + substitution of expensive and time consuming offline analytics
- + intuitively operated software

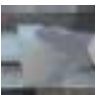
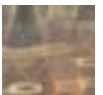
## Application fields:

- + screening for an optimal production strain
- + medium optimisation
- + quality control of complex compounds
- + optimisation of the inoculum for fermenters
- + testing of influences of different compounds on the culture
- + improvement of scale up
- + bioprocess development
- + ...



## Reference Systems:

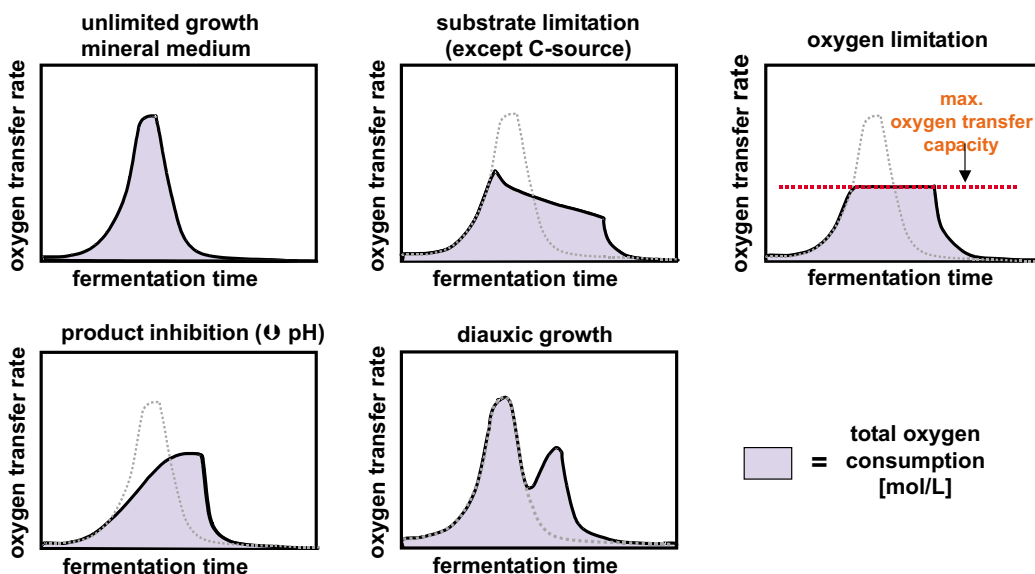
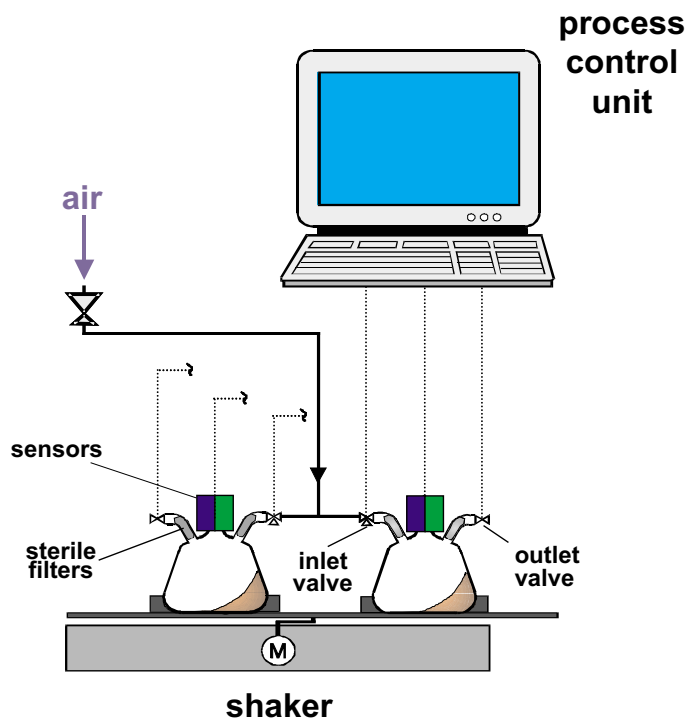
*Bacillus spez.*  
*Botrytis cinerea*  
*Catharanthus roseus*  
CHO Cells  
*Corynebacterium glutamicum*  
*Escherichia coli*  
*Gluconobacter oxidans*  
*Hansenula polymorpha*  
Hybridoma cells  
*Lactobacillus kefir*  
*Nicotiana tabacum*  
*Pichia pastoris*  
*Pichia stipitis*  
*Pseudomonas fluorescens*  
*Pseudoalteromonas haloplanctis*  
*Pseudomonas putida*  
*Saccharomyces cerevisiae*  
*Streptomyces lividans*  
*Vibrio natregiens*  
*Xanthomonas campestris*



**Kuhner SHAKER**

# RAMOS (Respiration Activity Monitoring System)

During fermentation a measuring cycle is continually repeated. This measuring cycle is separated into a measuring and a rinsing phase. During the rinsing phase air flows through the measuring flasks. At the beginning of the measuring phase the inlet and outlet valves of the measuring flasks are closed. The sustained respiration activities of the microorganisms lead to a change of the partial pressure of oxygen and carbon dioxide in the headspace of the particular measuring flasks. At the end of the measuring phase a computer calculates from the changes of the partial pressures the oxygen (OTR) and the carbon dioxide transfer rate (CTR) in the particular measuring flasks.



The patterns show the influence of biological phenomena on the OTR. Figure (top left) represents the OTR during unlimited growth of a microbial culture. The OTR rises with the number of cells until the OTR levels off and drops down. This sharp decrease of the OTR indicates the exhaustion of the carbon source. This curve in the figure (top left) illustrates an ideal course of the OTR. Every deviation from this ideal shape gives the user information about the fermentation conditions of the culture. Thus, limitations, inhibitions and diauxic growth can be easily detected by RAMOS.

- We can send you:
- publication list
  - reference list
  - example experiments
  - offer