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Uniform and reproducible stirring in a microbioreactor

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At present, research in bioprocess science and engineering increasingly requires fast and accurate analytical data (rapid testing) that can be used for investigation of the interaction between bioprocess operation conditions and the performance of the bioprocess. Miniaturization is certainly an attractive option that potentially allows for obtaining vast amounts of experimental data. Microbioreactors indeed have clear advantages, like small volume (and thus small footprint), little or no need for cleaning (one time usage), high throughput (multiple microbioreactors in parallel), high information content and control capabilities.

Even though microbioreactors have many advantages, it is important to bear in mind that they also have issues related to their size and handling. Evaporation, proper and reliable stirring, interconnections between micro and macro world are just some of the burning problems that need to be addressed. In addition, signal collection of different process variables in microbioreactors is not straightforward. It relies on analytical methods which are not sufficiently developed at the moment. Moreover signal collection is not cheap and straightforward.

Another important question is which microbioreactor volume is optimal while keeping in mind the final objective – application. Do we need a sample or not? Do we talk about cells in suspension or adhered on some substrate? Final microbioreactor design should thus strongly depend on the final goal of a specific microbioreactor application.

In order to address some of these questions, we are currently investigating and developing a microbioreactor platform with a reactor volume up to 1ml, as we believe that this volume is of interest to many industrial applications. It is widely known that stirring plays a very important role in achieving successful cultivations by promoting uniform process conditions and – for aerobic cultivations – a high oxygen transfer rate. In this contribution, the development of a suitable, reliable and reproducible stirrer in a microbioreactor for batch and continuous cultivation of *S.cerevisiae* will be demonstrated.