**Determination of oxygen consumption**

In order to evaluate the oxygen uptake rate by microbial activity, the following material balance for oxygen can be established:

**equation(1)**



where OTR(*t*) and OUR(*t*) are the oxygen transfer rate from air bubbles to liquid media and the oxygen uptake rate at a given time (*t*), respectively. The term OTR(*t*) can be described in terms of the volumetric oxygen transfer coefficient (*K*L*a*) and the driving force of mass transfer (difference between saturated (DO\*) and bulk (DO(*t*)) oxygen concentration):

**equation(2)**

**OTR(*t*)=*K*L*a*[DO\*−DO(*t*)]OTR(t)=KLa[DO\*−DO(t)]**

where the *K*L*a* value was estimated to be 25.2 × 103 day−1 by using unsteady state method as described elsewhere [[7]](http://www.sciencedirect.com/science/article/pii/S0032959204002122#bib7) and [[13]](http://www.sciencedirect.com/science/article/pii/S0032959204002122#bib13).

Here, it should be noted that in an oxygen-limited bioreaction system like the slurry bioreactor used in this study [[7]](http://www.sciencedirect.com/science/article/pii/S0032959204002122#bib7), the variation of dissolved oxygen (dDO(*t*)*/*d*t*) is much smaller than OTR(*t*) and the reactor operation can therefore be considered as quasi-steady state [[13]](http://www.sciencedirect.com/science/article/pii/S0032959204002122#bib13). In the present study, dDO(*t*)*/*d*t* was only less than 0.02% of OTR(*t*) during whole experimental period. Therefore, with this quasi-steady state assumption, the material balance (Eq. [(1)](http://www.sciencedirect.com/science/article/pii/S0032959204002122#eq1)) is simplified as follows:

**equation(3)**

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The cumulative amount of oxygen consumption during the slurry-phase decomposition of food wastes can calculated by integrating the oxygen uptake rate (OUR(*t*)) of the microorganisms:

**equation(4)**



where OC(*t*) is the cumulative amount of oxygen consumption (g l−1), OUR(*t*) is the oxygen uptake rate (g l−1 day−1) at time *t*, and *ti* is the *i*th sampling time (day). The numerical integration in Eq. [(4)](http://www.sciencedirect.com/science/article/pii/S0032959204002122#eq2) was carried out by a trapezoidal method [[2]](http://www.sciencedirect.com/science/article/pii/S0032959204002122#bib2) using the technical computing software Mathematica [[15]](http://www.sciencedirect.com/science/article/pii/S0032959204002122#bib15).

**Bacterial Growth formula in food decomposition**



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**The Correlation of Oxygen consumption and decomposition of carbon molecule in food**



