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DIRECTRICES PARA LA CARACTERIZACION DE BIOCATALIZADORES INMOVILIZADOS

Preparadas por el Grupo de Trabajo sobre «Immobilized Biocatalysts» de la Federación Europea de Biotecnología.

INTRODUCTION

Purpose and Scope

The recommendations relate to particulate catalysts with emphasis on preparative and industrial applications. Additional guidelines relevant to analytical, biomedical, photochemical and other special applications will have to be drawn up by experts in these fields. However, some of the general considerations are relevant also to these areas.

General guidelines for characterizing immobilized biocatalysts were drawn up at the first Enzyme Engineering Conference in 1971. Since then not only the problems but also the perspectives have changed. Furthermore, examination of the extensive literature shows that adequate characterization of the catalysts is an exception rather than a rule with the result that a large part of the published information cannot be evaluated and classified.

Recognizing the need for better information a group of scientists reviewed the problem compiling the list of fundamental parameters and describing or proposing methods to measure them. However, no general recommendations were made.

The present Working Party, appointed by the European Federation of Biotechnology, has considered the subject and drawn up new guidelines.

The goal of the Working Party has been to define the minimum parameters to give a satisfactory description of an industrial immobilized biocatalyst. We realize that our recommendations should be read as general minimum requirements and general guidelines. Special situations give rise to further demands.

Definition of immobilized biocatalysts

Immobilized biocatalysts are enzyme cells or organelles (or combination) which are in a state that permits their reuse. Example: Immobilized enzymes embrace soluble enzymes (e. g. used in a semipermeable membrane reactor) and insoluble enzymes (e. g. used in a fixed bed reactor).

RECOMMENDATIONS

List of desirable minimum requirements for characterization of an immobilized biocatalyst

0. *General description*
   - 0.1 Reactions scheme
   - 0.2 Enzyme and microorganism
   - 0.3 Carrier type
   - 0.4 Method of immobilization

1. *Preparation of the immobilized biocatalyst*
   1.1 Method of immobilization, reaction conditions
   1.2 Dry weight yield, activity left in supernatant

2. *Physical/chemical characterization*
   2.1 Biocatalyst shape, mean wet particle diameter, swelling behaviour.
   2.2 a. compression behaviour in column systems
   or
   b. abrasion in stirred vessels.
   or
   c. minimum fluidization velocity and abrasion in fluidized beds.

3. *Immobilization biocatalyst kinetics*
   3.1 Initial rates vs. substrate concentration for free and immobilized biocatalysts, effect of pH and buffer.
   3.2 Diffusion limitations in the immobilized biocatalysts system (effect of particle size or enzyme load on activity).
   3.3 Degree of conversion vs. residence time (points on a curve).
   3.4 Storage stability (residual initial rate after storage for different periods).
   3.5 Operational stability (residual initial rate (or transforming capacity of reactor system) after operation for different periods).

Further Comments to these Guidelines, and an illustrative paper can be found in *Enzyme and Microbial Technology*, **5**, 297-307, 1983.

ANTONIO BALLESTEROS, Instituto de Catálisis del C.S.I.C., Madrid-6, y JOSÉ L. IBORRA, Departamento de Bioquímica, Facultad de Medicina, Universidad de Murcia, Murcia.