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PROCESS AND DEVICE FOR THE ISOLATION OF FRACTIONS OF A SUBSTANCE MIXTURE ELECTROPHORETICALLY SEPARATED IN A CARRIER GEL

Ludwig Strauch, Munich, Germany, assignor to Kurt Hannig, Munich, Germany
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22 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates to the apparatus and process for the quantitative determination and obtaining of product fractions of a mixture of substances which migrate in a carrier material infiltrated by a buffer solution and which are eluted upon emergence from said carrier material and which is characterized in that to the elution liquid is imparted a concentration of substances in said mixtures of substances which is proportional to the true content of the fraction of the substance in the mixture of substances through an adaptation of the elution rate to the migration speed of the fraction and the content of the fraction in the mixture is subsequently determined.

THE PRIOR ART

The electrophoretical separation of mixtures of substances in finely cross-linked carrier gels, as for instance, gels from starch, polyacrylamide, gelatin, and proteins, produces, as compared to electrophoresis in solid, porous carriers, such as paper, cellulose acetate, PVC-spheres, glass-powder and others, a much more comprehensive and sharper fractionation since use is made not only of the difference in electrical charge of every individual component of the mixture but also of their difference in molecular size as well, for the separation of the components of the mixture. During the electrophoretic migration through the pores of the three-dimensional gel structure, the larger molecules are slowed as compared to smaller, equally charged molecules by means of the so-called molecular sieve effect. Through this effect, a substance mixture, containing equally charged molecules which, however, are different in size, can be divided into further fractions.

The use of these methods, however, is, up to the present time, restricted to the field of analytical determination only, since the isolation of the fractions from the gel following the electrophoretic separation has not yet been solved in a technically satisfactory way. In most cases, those gel areas, which contain the desired fractions are cut out of the total gel area after the electrophoresis, and the separated substances contained therein are eluted or extracted in a burdensome way and with a poor output. Known devices operate with losses in substances or employ intricate elution systems which result in great dilutions of the extracted fractions.

OBJECTS OF THE INVENTION

It is an object of the invention to develop a device and a process for the quantitative determination and obtaining of product fractions of a mixture of substances which migrate in a carrier material infiltrated by a buffer solution by proper elution.

Another object of the invention is the development of a process for the quantitative determination and

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obtaining of product fractions of a mixture of substances which comprise the steps of causing a mixture of substances to migrate through a carrier material, infiltrating a buffer solution through said carrier material whereby said mixture of substances are separated into individual fractions during said migration through said carrier material, eluting said separated substances on emergence from said carrier material by means of an elution liquid, adapting the elution rate to the migration speed of said separated substances whereby the concentration of said separated substances in said elution liquid is proportional to the true content of said separated substances in said mixture of substances, and separately recovering said elution liquid containing therein a concentration of said separated substances proportional to the true content of said separated substances in said mixture of substances.

A further object of the invention is the development of a device for the quantitative determination and obtaining of product fractions of a mixture of substances which comprises a separation chamber filled with a carrier material and buffer solution, means for feeding a mixture of substances to be separated at one end of said separation chamber, said mixture of materials to be separated having fractions having separate predetermined migration speeds through said carrier material, an elution chamber attached to the other end of said separation chamber, means to feed an elution liquid into and out of said elution chamber, and means to adjust the rate of said feed of said elution liquid through said elution chamber proportionally to said predetermined migration speed of the fractions of said mixture of materials to be separated.

These and other objects of the invention will become more apparent as the description thereof proceeds.

THE DRAWING

FIG. 1 is a schematic cross-section of the device of the invention utilizing gel-electrophoresis in order to obtain product fractions.

FIG. 2 is a schematic cross-section of an extended arrangement of the device of the invention showing various embodiments for varying the rate of flow of the elution liquid proportional to the migration speed of individual fractions of the mixture of substances to be separated.

FIG. 3 is a diagram showing the separation of the individual fractions of the mixture of substances to be separated according to the process of the invention.

DESCRIPTION OF THE INVENTION

The present invention, therefore, achieves a process and a device with the help of which these disadvantages of the prior art can be overcome and the objects of the invention can be obtained. This invention makes it possible to carry out an exact, quick and certain determination of the extracted fractions of a mixture of substances having varying migration speeds through the carrier material.

According to the invention a process is described for the quantitative determination and obtaining of product fractions of a mixture of substances, each fraction of which migrates in a carrier material infiltrated by buffer solution at a different migration speed and which are eluted upon emergence from the carrier material and which is characterized in that to the elution liquid is imparted a concentration which is proportional to the true content of the fraction in the mixture through adaptation of the elution rate to the migration speed of the fraction and the content of the fraction in the mixture is subsequently determined.