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(54) **IN VITRO EVOLUTION IN MICROFLUIDIC SYSTEMS**

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See application file for complete search history.

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(57) **ABSTRACT**

The invention describes a method for isolating one or more genetic elements encoding a gene product having a desired activity, comprising the steps of: (a) compartmentalizing genetic elements into microcapsules; and (b) sorting the genetic elements which express the gene product having the desired activity; wherein at least one step is under microfluidic control. The invention enables the in vitro evolution of nucleic acids and proteins by repeated mutagenesis and iterative applications of the method of the invention.

9 Claims, 25 Drawing Sheets