Unique High Performance Hybrid Magnetic Separation Technology for Molecular Separation, Single Molecule Manipulation, and Broader Bio-Medical Applications

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Abstract

Hybrid magnetic technology is in use in production and R&D molecular separation processes by the DOE Joint Genome Institute and is in continuing development at Lawrence Berkeley National Laboratory. Its fields of applicability range from genomics, proteomics and single molecule microscopy to bio-medical and general industrial processes. In addition to existing, production hybrid magnet plates for 384-well microtiter plate applications; new designs have been developed for 96-well, 384-well, 1536-well and deep well plates. These new, more advanced, second-generation magnet plates incorporate higher performance core structures that deliver higher fields and stronger gradients for faster drawdown and greater holding power for more robust processes. Field measurements of new prototypes have shown peak fields approaching 12000 gauss. These field strengths are up to 300% greater than those of commercial magnet plates. Development has proceeded on 1536-well magnetic structures that also have applicability for high-efficiency microarray processes.

A newer field of application for hybrid structures is single molecule magnetic manipulation or magnetic tweezers. This technology has significant advantages over laser capture/manipulation techniques and has the ability to cover a manipulation force range from zero to that of atomic force microscope levels. Successful prototypes are now in use at various institutions.

In addition to established applications, hybrid magnetic technology shows promise in other areas such as bio-medical treatment techniques and industrial applications. This technology is currently being made available to industry through the Tech Transfer Department at Lawrence Berkeley National Laboratory.

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