NANOCHANNEL ARRAYS AND THEIR PREPARATION AND USE FOR HIGH THROUGHPUT MACROMOLECULAR ANALYSIS

Abstract

Disclosed nanochannel arrays are suitable for performing high throughput macromolecular analysis. Interferometric lithography, nanoimprint lithography, and non-isotropic deposition techniques are used to prepare nanochannel arrays which have hundreds of thousands to more than a million enclosed channels with desired key dimensions across the surface of a silicon wafer substrate. The nanochannel arrays include a surface with a plurality of channels. The channels are surmounted by sealing material to render such channels enclosed. The nanochannel array preparing methods include the steps of, providing a substrate surface, forming a plurality of channels, and depositing a sealing material on the channels for rendering enclosed channels. The enclosed channels have a trench width of less than 150 nanometers and a trench depth of less than 200 nanometers. Nanofluidic chips are disclosed which include said nanochannel array, a sample reservoir, and a waste reservoir. The channels of the nanochannel array admit a fluid. Being in fluid communication with the channels, the sample reservoir releases the fluid, and the waste reservoir receives the fluid. Disclosed systems carry out analysis, including a nanofluidic chip and a data processor. Said chip includes said nanochannel array, and said sample reservoir. Methods are disclosed which include analyzing steps of, providing said nanofluidic chip, providing said sample reservoir, transporting elongated macromolecules contained in a fluid, detecting a signal from said elongated macromolecules, and correlating the detected signal to a property of the macromolecules. Cartridges are disclosed which include said nanofluidic chip, being inserted into said system.

FIG. 9