Mass assembly technology for large arrays of capillaries

Craig R. Forest, Darragh Buckley, Ian Collier, Ian W. Hunter

Manual assembly of capillary arrays comprising hundreds of capillaries for electrophoresis instrumentation is laborious and costly, and becomes impractical for ultra-high throughput arrays of thousands of capillaries. A semi-automated capillary array assembling machine has been created to facilitate this task, reducing assembly time by two-thirds as compared to manual assembly. In this device, a linear stage is automatically indexed to successive positions in a two-dimensional array. At each position, a cartridge containing 10-30 capillaries is repeatably attached to the stage using kinematic couplings. The key feature of this design is the steel cartridge that contains a row of evenly spaced trapezoidal troughs accurately fabricated by microelectrode discharge machining (microEDM) to <5 µm process variation. Each trough non-destructively pinches a capillary upon application of a preload force, thus constraining it for insertion into the array. The cartridge is easily filled with capillaries by rolling a bundle of them across the troughs. This array assembly technology eliminates time-consuming handling and meets assembly alignment tolerances, enabling array manufacture with dramatically reduced time and cost.

Correspondent:
Craig R. Forest
Massachusetts Institute of Technology
77 Massachusetts Ave. Room 3-147
Cambridge, MA 02139
USA
617-258-0533
617-252-1849
cforest@mit.edu