AzTE Arizona Technology Enterprises

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Nanoscale Ink-Jet Printing

AzTE Case # M02-078

Inventor

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Intellectual Property Status:

US Patent 10/513,433

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Background

Existing methods of liquid deposition are either limited to micron-scale resolution or are time-consuming and cumbersome direct-contact techniques. Ink-jet printing has developed over recent years into a preferred method of dispensing liquid micro-droplets for the purpose of printing and microfabrication. This is an accurate, high-throughput, non-contact technique that has been used with a wide variety of fluids ranging from printer ink to electrical solder to polymers to biologically active molecules. Due to basic physical limitations, existing ink-jet printing is limited to feature sizes of ~15 microns or larger.

Invention Description

Taking advantage of certain characteristics of superfluid flow, researchers at Arizona State University have removed the constraints associated with common ink-jet printing, allowing rapid, universal, non-contact writing of features down to ~100 nm. The technique is almost certainly applicable with any atomic or molecular species that can be absorbed into or onto a superfluid droplet. Of particular interest is nanofabrication with biologically active molecules. Sponsored research continues in this area while industries such as bio-diagnostics, fuel cells, and MicroElectroMechanical Systems, otherwise known as MEMS show immense interest in this field.

Potential Applications

- Ability to deposit diverse materials such as conductive polymers, fine ceramics, metal particles, etc. at a micro/nano level
- Fabrication of printed circuitry and ultrafine wiring patterns
- Manufacturing of Labs-On-A-Chip
- Controlled deposition of intricate bio-arrays and complex bio-tissues
- Construction of entire bio-organs

Benefits and Advantages

- **Operates at atmospheric pressure** – Lower manufacturing costs
- **Enables smaller feature sizes** - Significantly smaller than current technology
- **Lower complexity** – No need for expensive lithography processing
- **'Invisible' Signatures –** Counterfeiting control