Micro-device transfer probe enables low cost photonic and electronic integration

Hybrid systems of photonic and electronic micro-devices are limited by the poor compatibility of component materials. This technology describes a method of integrating these material components on a single chip using a tungsten tip covered with polydimethylsiloxane (PDMS). With this adapted tip, individual micro-devices can be picked up, manipulated in space, and positioned on a new surface. The adhesion forces between the tip and the device can be customized by adjusting the preparation parameters of the PDMS. This low cost method could be used to select and transfer individual micro-devices for hybrid electronic and photonic integration.

Hybrid electronic and photonic integration using a PDMS probe enables low cost, high precision micro-device transfer

Hybrid electronic and photonic integration is achieved using a PDMS probe that can pick up, manipulate, and place a single micro-device with 300 nm precision. This probe can be customized for a given application to optimize adhesion forces between the tip and the micro-device. Additionally, it can be simultaneously used with a second probe to reorient the micro-device in space prior to placement on the surface. This device allows researchers to fabricate the micro-devices on a compatible surface and to select the most desired devices for transfer, thereby circumventing the challenge of growing high-quality compound semiconductors on silicon.

The utility of this technology has been demonstrated with the transfer of superconducting-nanowire single photon detectors, nano-diamond crystals, and photonic crystal membranes.

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Applications:

- Transfer of photonic or electronic micro-devices to a silicon substrate.
• Fabrication of integrated chips with photonic and electronic components.
• Transfer of various components involved in micro- and nano-fabrication of devices.

**Advantages:**

• Low cost.
• Easy to operate.
• Accurate alignment.
• Capable of single device manipulation.

**Patent information:**

Patent Pending

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