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Novel guided fluidic assembling technology for optical devices

Self-assembly of micro devices is an indispensable technology for their industrial and biomedical applications. High precision assembly of laser diodes (LD) and light emitting diodes (LED) on silicon wafer substrates for their various industrial uses in the optoelectronic unit devices is an important issue from a mass production point of view. An alternate to replace an obsolete pick and place flip chip bonding robotic technology with a simple, low cost and highly efficient technique is desired for the industrial applications. We have investigated a novel technique to assemble LD microchips with micrometer order accuracy. The rapid assembly of a number of high power edge emitting LDs is practically demonstrated. A 150 micrometer thick nickel metal mask is used to confine the LDs and guide the unassembled one simultaneously into their recesses

by its restricted displacements. This technique is based on guiding the optical devices within a suitable fluidic medium to perform assembling process in two steps: (i) coarse precision with a confinement mask to bring LDs near their recesses to achieve high assembling efficiency and (ii) fine precision due to electrode patterns on the base surface of LDs under fluidic as well as gravitational forces. The assembly of (i) 80 red LDs of the same size and (ii) 40 pairs of red and infrared LDs of two different sizes is successfully demonstrated within ± 2 micro meter precision with 100% efficiency in just few seconds after transferring all LDs into their confinement mask regions. The technological issues in fluidic assembly of optical devices fabrication for their practical applications will be discussed.

Biography

Brahm Pal Singh completed his Ph.D. in Quantum Electronics in 1990 from IIT Delhi, and D.Eng. in Quantum Engineering in 1996 from Nagoya University with Postdoctoral Studies at NPL New Delhi, India and AIST Tsukuba, Japan. Dr. Singh is a Research & Development Manager in Advanced Technologies Development Center, ES Company, Panasonic Corporation. He has published over 30 research papers in reputed journals and international conferences/symposiums and has been serving as a referee for the international reputed journals.

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