Focused ion beam technology and applications.

Seung-Oun Kang, Guang-Sup Cho*, Tae-Hwan Kim, and Yoonho Seo (Department of Physics, Kwangwoon University).
Ho-Jung Hwang (Department of Electronics, Jung-Ang University).
Chul-Ju Kim, Sun-Woo Prak (Department of Electrical Engeneering, Seoul City University).
Hong-Bay Jeong (Department of Electrical Material, Kwangwoon University).

Focused ion-beam(FIB) systems can now modify integrated circuits by cutting or adding wires only a micron across. These versatile tools are based on the liquid-metal ion (LMI) source, one of the brightest sources of charged particles yet invented. This source, coupled with an ion optical system, can produce a focused, steerable beam of charged atoms whose energy may range from one kiloelectronvolt to several hundred. The atoms can perform a variety of ultraprecise tasks: micromaching-the fabrication of micron-size objects as if by a miniaturized milling machine: maskless implantation of dopants to activate semiconductor materials: analysis of the elemental composition of surfaces: nanolithograpohy: and the repair of optical and X-ray lithographic masks.

Here we introduce the whole matters of FIB systems: the concept of LMIS and optical lens systems, and the specifications for a typical FIB. Moreover, FIB applications to VLSI are reviwed such as maskless implantation, lithography, mask repair, IC modification, device cross sectioning, micromachining, and device transplantation. Many kinds of failure analysis techniques and related equipments informations are also presented.

In this field we can see that FIB researches have expanded rapidly world-wide since the early 1980's, mainly in Europe, North America, and Japan.