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Latter half of 1960's
Ion Implanter

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The ion implantation method is a method to form a junction layer and replaced the vapor phase diffusion method from the 1970s, which enabled proportional reduction (scaling) of MOS transistors.
The idea of forming a junction layer by ion implantation method (using ionic bombardment) was patented by R. Ohl and W. Shockley et al. at Bell Telephone Laboratories around 1950 [1] [2]. While the gas phase diffusion method was in practical use for transistor formation, the ion implantation method continued to be developed in many companies and research institutions around the world through the 1950's and 1960's, and various ion implantation equipment were prototyped. The term ion implantation is said to have appeared by the article by K. Manchester et al. at the Aarhus Conference in 1965.
As an ion implanter that triggered full-scale development of transistor formation process by ion implantation method, ion implantation equipment of 300 KeV of Huge Aircraft in 1968 and that of 150 KeV of Sorbonne University in 1969 should be mentioned. In Japan, Hitachi developed a 200 keV ion implantation equipment in 1969 and was used to develop double ion implantation transistors and MOSFETs.
Thereafter, in 1973, production ion implantation apparatuses were released from Accelerator Inc., Varian (Extrion), Lintott, etc., and the ion implantation method was put into practical use. In Japan in 1974, Nissin Electric and Nihon Shinku(currently, ULVAC Inc.) produced the implanters domestically.

References:

【1】W. Shockley, "Semiconductor translating device," US Patent 2,666,814, filed 27 Apr 1949
【2】R.S. Ohl, "Semiconductor translating device," US Patent 2,750,541, filed 31 Jan 1950

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