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Late 1950's

Silicon single crystal

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A silicon (Si) junction transistor was developed by the Bell Telephone Laboratories in the 1950s, and in 1955 silicon transistors were released as products from Texas Instruments.

Si has a wider band gap than germanium (Ge), which realizes smaller off current and stable operations at higher temperatures, and Si became mainstream replacing Ge transistors. Initial Si single crystals for Si transistors were formed by the Czochralski method, like in the case of Ge, and metal Si by chlorine reduction method developed by Dupont in the 1940's [1] was used as the base Si material.

In the program of the Si transistor of Bell Laboratories announced in 1956, higher purity Si single crystals were required. For this reason, a method to obtain high purity Si by hydrogen reduction of TCS (SiCl_3H) developed by Siemens in the 1950's was adopted (commonly called Siemens Process), and metal Si production was replaced by this method by the late 1950's.

References:

[1] D. Holbrook, "Diversity, Complementary, and Cooperation Materials Innovation in the Semiconductor Industry"

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