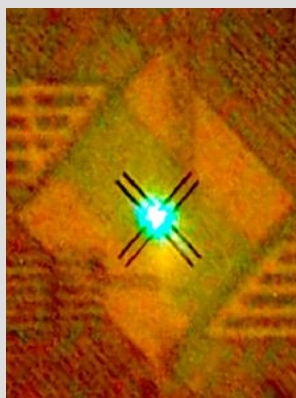


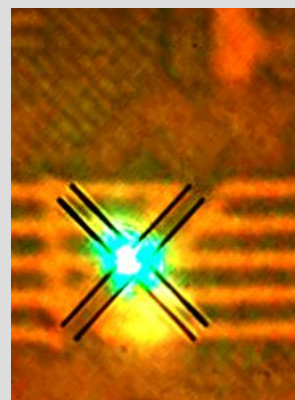
2006/6/13 Release

Mechanism of drive current enhancement in 45° rotated pMOS transistor clarified – originating in compressive uniaxial strain induced by STI -

Channel length = 20 μm



Channel length= 0.12 μm



Raman spectroscopy to examine the local strain of the silicon device in a nondestructive way

The Central Research Laboratory of Hitachi, Ltd. (GM: Mr. FUKUNAGA Yasushi) has investigated the phenomena of drive current enhancement in $\langle 100 \rangle$ channel pMOSFETs achieved by the 45° rotation of the (100) substrate, and clarified the mechanism of this performance improvement which until now has been controversial. The drive current enhancement was found to originate in the compressive stress which arises from shallow trench isolation (STI) structures, used to create separation between transistors, leading to strain in the silicon crystalline structure. It was found that if this compressive stress was applied biaxially, that is, in both the parallel and perpendicular direction of the current pathway (channel), drive current was further enhanced and performance increased. As the drive current is an important factor determining LSI performance, the clarification of this mechanism is expected to contribute to further developments in increasing LSI performance.

Details of this research were presented at the 2006 Symposium on VLSI Technology, held in Honolulu, Hawai'i, U.S.A., from 13th - 15th June 2006.