Advanced transmission electron microscopy in opto- and microelectronics: State of the art, current problems and possible improvements.

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New microscopes are characterized by a high resolving power, an efficient probe forming optics and an improved vacuum. Interfaces can be viewed edge-on either by High Resolution Electron Microscopy (HREM) down to an atomic scale or by transmission electron microscopy under grazing incidence REM (Reflection Electron Microscopy) close to 1 nanometer resolution. Current applications of these techniques at EPFL will be used to compare them in terms of information content, actual and potential performances, specimen preparation requirements and effort, and also picture interpretation problems.

High resolution electron microscopy of $TiSi_2$ on doped Si

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In view of its applications in Si-VLSI technology, $TiSi_2$ has been formed by rapid thermal annealing (1) on As-, P- and B-doped Si. The effect of the different dopants on the silicidation has been studied by high resolution electron microscopy on cross-sectional samples. Dopant implantation dose and energy were respectively: As: 10^{16} cm^{-2}, 120keV; P: $2 \cdot 10^{15}$ cm^{-2}, 80keV; B: $4 \cdot 10^{15}$ cm^{-2}, 30keV. Compared to undoped Si, we found that the presence of As inhibits the silicidation and produces a highly irregular interface whereas the presence of P favors the reaction between Ti and Si and leads to a smoother interface. There is no marked difference between B-doped and undoped samples. Effects on electrical characteristics will be discussed.

(1) E. Stocker, P. Weiss, Soc. Suisse de Phys., Neuchâtel, avril 1986

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