MULTIPLE PULSE LASER ANNEALING TO ACTIVATE ULTRA-SHALLOW JUNCTIONS

ABSTRACT

A method for forming a highly activated ultra shallow ion implanted semiconductive elements for use in sub-tenth micron MOSFET technology is described. A key feature of the method is the ability to activate the implanted impurity to a highly active state without permitting the dopant to diffuse further to deepen the junction. A selected single crystalline silicon active region is first amorphized by implanting a heavy ion such as silicon or germanium. A semiconductive impurity for example boron is then implanted and activated by pulsed laser annealing whereby the pulse fluence, frequency, and duration are chosen to maintain the amorphized region just below its melting temperature. It is found that just below the melting temperature there is sufficient local ion mobility to secure the dopant into active positions within the silicon matrix to achieve a high degree of activation with essentially no change in concentration profile.

FIG. 2a