2.3 Penetration depth of lattice disorder produced by ion implantation in semiconductors

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2.4 A dechanneling model for the description of the temperature behaviour of the sputtering ratio

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2.5 Radiation damage, annealing and bubble formation in UO_2 induced by ion bombardment

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Radition damage in UO_2 has been studied mainly by means of neutron irradiation. Ion bombardment has been used for gas precipitation investigations by Barnes and Mazey[1] (2 keV He^+ ions, epitaxial thin films of UO_2) and by Williamson and Cornell[2] (100 keV Kr^+ ions, synthetic UO_2). Also Matzke[3] and Cornell and Banister[4] found small bubbles in UO_2 bombarded by heavy ions (40 keV Xe^+ ions, 100 keV Kr^+ inos.). For our studies we used arc melted UO_2 pellets. A very effective method of chemical polishing has been used. The results have been correlated to the neutron induced radiation damage and bubble formation given in the literature[5].

Thin foils of polycrystalline UO_2 were chemically polished to electron transparency and bombarded with 4 keV A^+ and 150 keV H^+ ions. The ion dose varied from 10^{15} to 10^{18} ions/cm^2. Irradiation temperature was 20°C, while the annealing was studied at temperatures of 900, 1200 and 1500 °C.

Electron microscope observations have shown that 4 keV A^+ ions produced damage in UO_2 in the form of large defect clusters, dislocations and complex dislocation tangles and networks. The intensity of damage increased with ion dose, but a „saturation" effect has been observed for all different orientations of grains at doses of approx. 5×10^{17} ions/cm^2. In Fig. 1 the damage in a UO_2