INDUCED SURFACE NANOFEATURES BY HIGH ENERGY HEAVY IONS IRRADIATION

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Using a high intensity ion beam current tandem accelerator[*], 3.66 MeV-Ni and -Al ions were implanted in Ni-Si alloys at 650 °C and α-Al_2O_3 at 1000 °C, respectively. The sample heating, to reach the corresponding experimental temperature, was achieved by a thermal resistance in the first case, whereas by radiation with a halogen lamp, in the second case. Such temperature was held constant within 10 °C as indicated through out by a pyrometer focused (1 mm in diameter) at the middle of the irradiated area (6 mm in diameter). All experiments were carried out under a 10^{-7} mbar pressure, to avoid sample oxidation and ion beam scattering by air molecules.

SEM observation evidences surface nanofeatures induced by such irradiation. By Ni-Si alloys, long parallel channels are formed having a periodicity near to 1 μm and a mean depth of 0.5 μm (AFM measurements). By α-Al_2O_3 nanopyramides, around 50 nm basis and similar high, were detected on some grains forming periodic chains.

We assume that both induced surface features were produced by preferential sputtering. In the Ni-Si alloys, Si atoms are preferentially sputtered from Si-rich zones forming ribbon-like surface features, while in α-Al_2O_3, the sharp faceted pyramids and their periodic arrays, induce to think that a crystallographic preferential sputtering is taking place during irradiation.

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