THE STRUCTURE OF THE TWO-DIMENSIONAL MoN SURFACE COMPOUND ON Fe-3.5%Mo-N(100) STUDIED BY X-RAY PHOTOELECTRON DIFFRACTION

A. Baraldi, B. Brena, D. Cocco, G. Comelli, S. Lizzit, G. Paolucci
Sincrotrone Trieste, Padriciano 99, 34012 Trieste, Italy

C. Uebing
Max-Planck-Institut für Eisenforschung
Max-Planck-Straße 1, D-40074 Düsseldorf, Germany

P. Baumann, V. Scheuch and H.P. Bonzel
Institut für Grenzflächenforschung und Vakuumphysik
Forschungszentrum Jülich, D-52425 Jülich, Germany

Molybdenum and nitrogen cosegregation is investigated on (100) oriented surfaces of Fe-3.5%Mo-N single crystals applying Auger electron spectroscopy (AES) and low energy electron diffraction (LEED). The formation of a two-dimensional MoN surface compound occurs at temperatures ranging from 500 to 790^{o}C. Ar^{+} ion depth profiling indicates that the MoN consists of approximately two compound layers. Within the AES detection limit the existence of three-dimensional MoN surface precipitates is ruled out. The MoN covered substrate surface exhibits a sharp (1x1) LEED pattern indicating the epitaxial stabilization of the MoN surface compound on the bcc(100) surface.

Angle-resolved photoemission of Mo $3d_{5/2}$, Fe 3p and N 1s core level photoelectrons is used to determine the structure of the MoN surface compound. Polar angle intensity distributions of photoelectrons (X-ray photoelectron diffraction) are recorded in the high symmetry [001] and [011] azimuths. The MoN surface compound consists of a double layer of Mo and a single N layer. The interlayer distances are determined according to $d_{Mo\rightarrow Mo}$=1.71 Å ± 0.07 Å and $d_{N\rightarrow Mo}$=0.65 Å ± 0.1 Å.