The superlattice hardening effect for tic/vc multilayers on the level of nanoindentations in relation to their structural parameters was investigated. Various multilayers of different period thicknesses were grown on sapphire (012) using pulsed laser deposition and targets of tic and vc. X-ray diffraction revealed the nanocrystalline structure of the thin layers. Moreover, a preferred orientation of the (110) planes of tic and vc parallel to the film surface was observed. Polarized fluorescence exafs experiments were carried out at hasylab. Considering the different weights of the in-plane and out-of-plane contributions from the nearest neighbors to the exafs signal the lattice parameters exhibit a legible dependency on the period thickness of the tic/vc-multilayers, smaller values in-plane than out-of-plane and allow the determination of internal stresses in the multilayers. Nanoindentation experiments were carried out using a depth sensing electrostatic transducer (hysitron triboscope®) and a Berkovich Indenter. Nanohardness and elastic modulus of the film/substrate combination showed only a slight dependence on the contact indentation depth according to the behavior of a hard film (33 gpa - 39 gpa) on a hard substrate (30 gpa). The hardness of the tic/vc multilayers increased after high-temperature heat treatment (5 h at 500° c) and decreased for the single-layer films. For the annealed films a maximum of the nanohardness of 39 gpa could be observed for a period thickness of about 5 nm. Thus superlattice hardening on a nanoscale has been found in this system.

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