INITIATION OF PLASTICITY IN NANOSCALE DEFORMATION OF ScB_2 AND LaB_6 SINGLE CRYSTALS

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Nanoscale mechanical behaviour of ScB_2 and LaB_6 single crystals in directionally solidified eutectic composite LaB_6–ScB_2 have been studied by nanoindentation. Sharp elastic-plastic transition (*pop-in*) caused by homogeneous dislocation nucleation in previously dislocation-free volume under the contact (Fig.1) was observed for both phases. It allows for us to make experimental estimation of theoretical shear strength (limit of elastic stability) of ScB_2 and LaB_6 single crystals. Experimental estimates ($\approx G/9$) are in good agreement with theoretical estimates ($G/2\pi$). This suggests that theoretical shear stress of hard and brittle borides can be observed directly using nanoindentation.

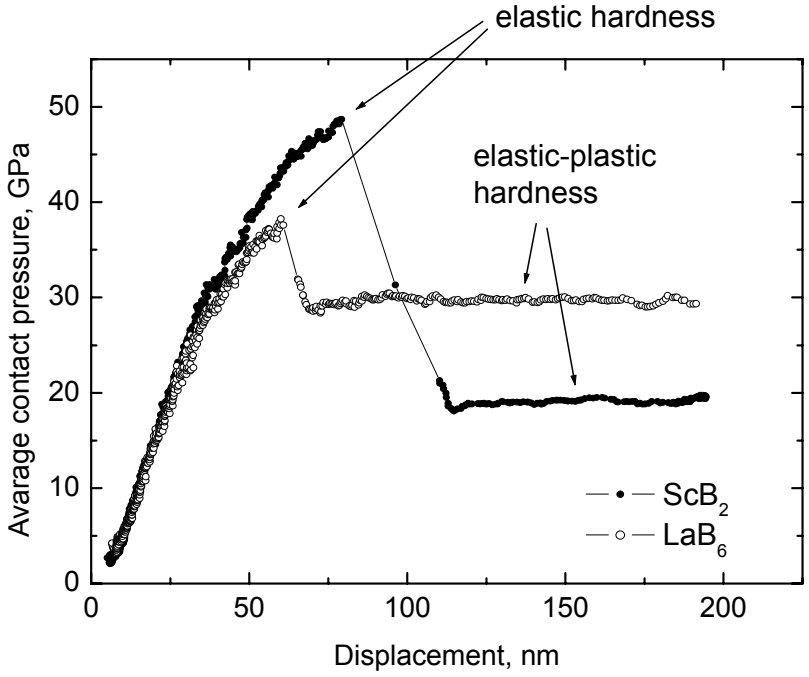

Fig. 1 Average contact pressure vs. displacement in ScB_2 and LaB_6 single crystals. Sharp elastic-plastic transition in the contact is caused by homogeneous dislocation nucleation in previously dislocation-free volume under indent at shear stress close to theoretical shear stress