PLASTICITY OF AN ATOMICALLY LAYERED CRYSTAL: A COMBINED NANOMECHANICAL AND AB INITIO STUDY ON Mo2BC

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Key Words: microcompression, TEM, ab-initio, nanolayered crystal, anisotropy

Plasticity in atomically layered crystals, such as X2BC or MAX phases, is not yet fully understood. Particularly plasticity on non-basal planes is rarely considered. The reason for this lies both in the prevalence of basal deformation observed (MAX) or predicted (X2BC) and the difficulties in performing single crystal experiments on anisotropic and brittle materials challenging to produce in bulk form. We therefore employed a combined approach using microcompression, TEM including conventional and LACBED dislocation analysis and ab initio calculations to elucidate the active deformation mechanisms in Mo2BC. We show that appreciable ductility in Mo2BC is indeed achieved due to the activation of previously unexpected non-basal slip.

Figure 1 – Combination of ab-initio calculations and microcompression with SEM/EBSD and TEM