Behavior and functionality of dislocations in inorganic crystals

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Functionality of dislocations in inorganic crystals has attracted attention as a promising avenue for future materials innovation due to the novel functionalities provided by the unique atomic and electronic structures at the dislocation cores [1-7]. We have reported that it is feasible to add new functions to existing materials using dislocations [1]. Recently, it has become clear that dislocations can be affected not only by mechanical stresses but also by electronic or electrostatic fields, which alter electronic and atomic structures of the dislocation cores. We have been recently focusing on the interaction between dislocations and the light environment, exploring detailed mechanisms of light environment on the dislocation behaviors [3-6]. Of particular interest is the dependence of the deformation behavior of semiconductor crystals on the light conditions. It is intriguing that controlling the light condition enables semiconductor crystals to develop extraordinarily large plasticity even at room temperature. Since it is difficult to investigate the behavior of dislocations in advanced materials with the small size due to their manufacturing limit, we are also establishing nanoscale experimental techniques applicable to small size crystals [5]. Our research results and recent progress on the behavior and functionality of dislocations in inorganic crystals will be discussed in this time.

References

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