Resolving Crystal Selection Processes During Optical floating Zone Crystal Growth – Novel Non-Destructive Synchrotron and Software Tools for Rapid Grain Tracking

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The optical floating zone (OFZ) technique for crystal growth was described as "arguably the best thing to happen to single-crystal growth in the past 25 years" in the 2009 NRC report on "Frontiers in Crystalline Matter". Despite the importance of the OFZ method, the growth process remains poorly understood due to a lack of quantitative information. We are developing synchrotron diffraction mapping methods that can non-destructively probe large (cm-scale) crystal growth boules. These methods allow us to follow crystal selection process that occurs during OFZ crystal growth, to resolve the direction-dependence of crystal growth rates, and to track how crystal perfection changes during the growth. In this work, we applied our unique methods to determine the preferred growth direction of rutile TiO_2 crystals and to understand how the growth conditions affect the products of crystal growths.

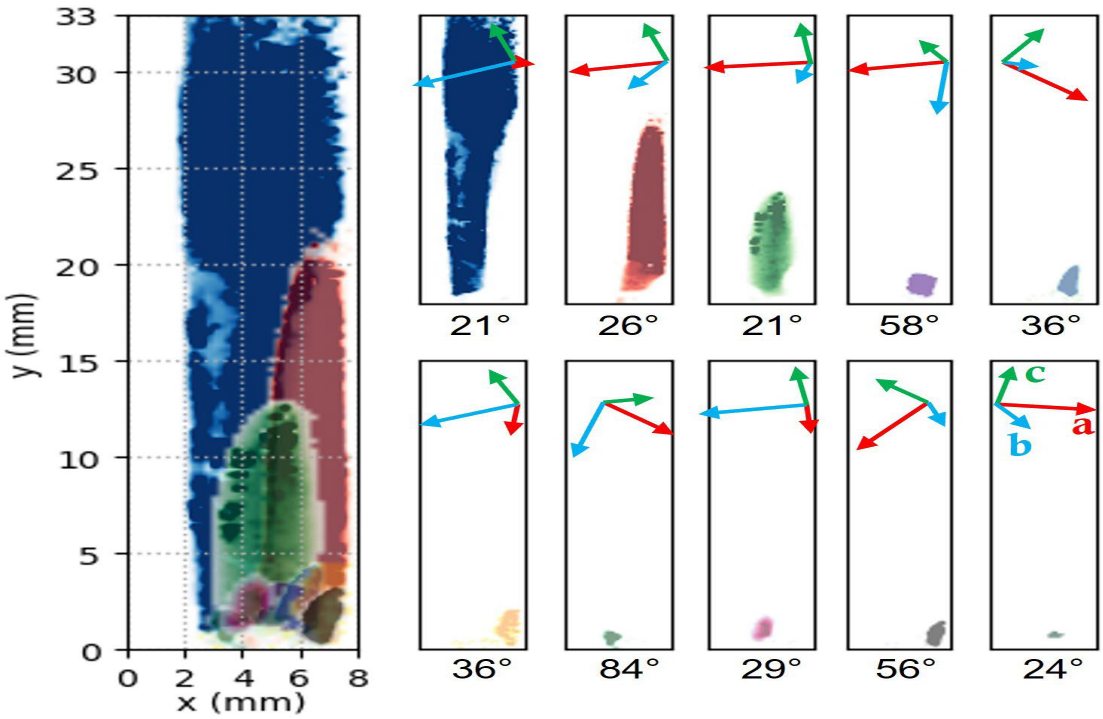

Figure 1