T. Yoshikawa LAB.

[Production of semiconductors from molten alloy – solution growth of next-generation semiconductor SiC and AlN]

Integrated Research Center for Sustainable Energy and Materials

Laboratory of High Temperature Sustainable Materials Processing

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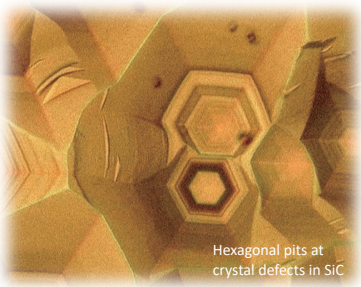
Creating innovative materials processings

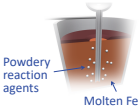
To try developing the innovative materials process — combining high temperature physical chemistry (including thermodynamics and crystal growth) with an original visualization technique of high temperature process.



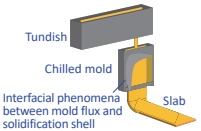
SiC dissolution interface (1300˚C)

Control of reacting interface during steelmaking process

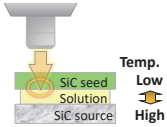
Tens or hundreds tons of molten steel react during steelmaking process, but the reaction proceeds thorough micron-scale phenomena. We try to contribute to the design of sustainable process for the 21st century.



Reaction control between molten Fe and reaction agents

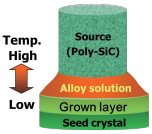


Microstructure control during the solidification in mold



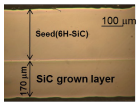
Solution growth of single crystals of wide-gap semiconductors

Silicon carbide (SiC) and aluminum nitride (AlN) are key materials to achieve the innovation in power conversion and optical devices. We are developing the rapid growth technique to produce their high quality single crystals.



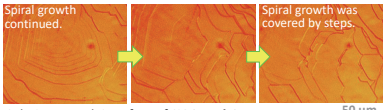
Low temperature rapid growth of SiC by the float zone method

World's fastest growth below 1500˚C



Real-time observation of high temperature reacting interface using visible light transmission

We carry out the in-situ observation of the high temperature interface using the visible light transparency of materials.
For example, we observed the growth interface during the solution growth of SiC for the first time. We aim at establishing the optimal condition for the growth of high quality crystal of SiC based on the nano-scale interface observation.



Solution growth interface of SiC (1400˚C)