Microstructure of Oxynitride Thin Films

Kazuma SUZUKI

Assistant Professor s-kazuma@sendai-nct.ac.jp

Affiliated Societies The Japan Institute of Metals and Materials

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Research Topics

- Preparation of superhard oxynitride thin films
- Novel hardening technique of thin films by addition of elements

Research Seeds

Our research topic is hard coating materials for cutting tools, molds, and frictional components. We have mainly investigated chromium oxynitride (Cr(N,O)) thin films synthesized by partial replacement of N with O. The hardness of Cr(N,O) thin films increased with their oxygen content [1]. However, the hardening of Cr(N,O) could not be explained by the two main strategies (solution hardening and hardening by nanocomposite morphology). Recently, we found that the hardening of Cr(N,O) was caused by dislocation pinning at the boundaries of the nano-lamellar morphology [2, 3]. Findings of this work are expected to be applied as the design guideline for novel hard coating materials.

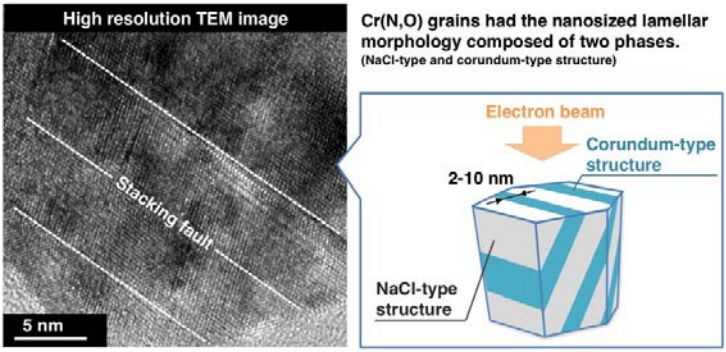

Fig. 1 Nano-lamellar morphology in the Cr(N,O) grain observed using high-resolution transmission electron microscopy.

[1] K. Suzuki *et al.*, *Mater. Trans.* **54** (2013) 1140.
[2] K. Suzuki *et al.*, *APL Mat.* **3** (2015) 096105.
[3] K. Suzuki *et al.*, *Thin Solid Films* **625** (2017) 111.

Related Technology

- Preparation of thin films by physical vapor deposition (PVD)
- Crystal structure analysis by X-ray diffraction (XRD)
- Crystal structure and microstructure analysis by transmission electron microscopy (TEM)