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Enhancement of crystallinity and critical current properties of fluorine-free MOD processed YBCO films by introduction of oxyhalide Ba2Cu3O4X2 (X = Cl, Br)

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The fluorine-free metal organic decomposition (FF-MOD) is one of the most promising methods for preparing REBa₂Cu₃O_{*y*} (REBCO, RE: rare earth elements) coated conductors because the simple chemical reaction to form textured REBCO phases is completed in a short time without any necessity of vacuum chambers or high power laser devices. However, reproducibility is not always high due to generation of misaligned grains inside the film. Therefore, coated conductors with long length have not yet been developed by FF-MOD method.
Our recent study revealed that halogen-addition to the starting solution resulted in generation of oxyhalides, Ba₂Cu₃O₄*X*₂ (Ba2342), where only Cl and Br can be the candidate for *X* of Ba2342 composition. The Ba2342 crystal is a layered compound where [Cu₃O₄]²⁻ layers and [Ba₂*X*₂]²⁺ layers are alternately stacked. It should be noted that the size of Cu₃O₄ plane is almost same as that of CuO₂ plane in YBCO crystal. We have found that Ba2342 precipitates helped biaxial alignment of YBCO due to the perfect lattice matching, and hence highly textured YBCO films were obtained with high reproducibility by introduction of Ba2342. Also, co-doping of Ba2342 and impurity metal such as Hf and Zr is significantly effective to enhance flux pinning properties of FF-MOD processed YBCO films. Various interesting effects of oxyhalides on microstructures and superconducting properties will be discussed.

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