

## Growth Conditions of Sequentially Electrodeposited Buffer Layers for YBCO Superconductor

Sovannary Phok, Wenjun Zhao, and Raghu Bhattacharya

**Abstract** — We report recent technical advances in the fabrication by sequential electrodeposition (ED) of buffer architectures with two stacking layers. The proposed approach is to fabricate a structure containing a pyrochlore oxide and  $\text{Gd}_2\text{O}_3$ , which takes advantage of the low oxygen diffusivity in pyrochlores and the excellent crystal lattice match of  $\text{Gd}_2\text{O}_3$  and  $\text{YBa}_2\text{Cu}_3\text{O}_{7-\delta}$  (YBCO). A systematic study is performed for a fundamental understanding of the buffer structure grown by ED. The electrolyte composition, solution flow rate, composition/concentration of chemicals, and annealing conditions are found to affect considerably the deposition of the layer, formation of the pyrochlore oxide, and film texture.

**Index Terms** — Buffer layers, Electrodeposition, Pyrochlore compound,  $\text{RE}_2\text{O}_3$  compound, Texture.

Manuscript received 19 August 2008.

This work has been performed by an employee of the Midwest Research Institute under Contract No. DE-AC36-99GO10337 with the U.S. Department of Energy. The United States Government retains a non-exclusive, paid-up, irrevocable, worldwide license to publish or reproduce the published form of this work.

S. Phok, W. Zhao, and R. Bhattacharya are with the National Renewable Energy Laboratory, Golden, CO 80401 USA (phone: 303-384-6413; fax: 303-384-6432; e-mail: [sovannary\\_phok@nrel.gov](mailto:sovannary_phok@nrel.gov)).