OAK RIDGE NATIONAL LABORATORY
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Cap Layer for YBCO Films for Use in Superconducting Wires

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Technology Summary

The basic idea is to use a cap layer of a double perovskite phase for growing the superconducting film. Since this phase has a large lattice mismatch with REBCO or YBCO films, it is expected that the c-axis of YBCO phase will sharply tilt towards the substrate normal. When this happens, the full-width-half-maximum of the rocking curve or the omega scans both for rocking in the rolling direction and about the rolling direction, is expected to sharpen considerably. This could result in a YBCO or REBCO layer with a FWHM of the out-of-plane texture of only a few degrees. This may in turn also make the FWHM of the in-plane texture sharper. This improvement in texture could result in massive enhancement in the critical current density of the films. Also, unlike the presently used cap buffer layers of CeO2 and LaMnO3, wherein reaction with YBCO or REBCO are observed, the double perovskite phase materials of the present invention have essentially no reaction with YBCO. The double perovskite phase cap layer may also serve as a diffusion barrier layer since it has low reactivity and may also have less diffusion of cation elements through it.Lastly, the double perovskite phase layer could also serve as a seed layer in addition to serving as the diffusion and cap layer. So it could serve as a single buffer layer. This could be very significant if shown possible.

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