Fine tuning APC concentration in *RE*BCO coated conductors through surface modified target method

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Abstract:

Increased critical current density in higher applied magnetic fields is highly desired for *RE*BCO thin films on textured substrates for widespread technological applications [1]. Many methods have been successfully used to improve the critical current properties of *RE*BCO films by incorporating artificial pinning centers (APCs). A novel approach for APC incorporation in *RE*BCO films using pulsed laser deposition technique is to use surface modified target method in which a thin sectored/rectangular shaped piece of secondary phase material is attached onto the top of *RE*BCO target using silver paste. As the target is rotated, both *RE*BCO and APC material portions are alternatively ablated by high energy laser pulses. The advantages of this method are that the *RE*BCO portion and APC material portion are physically separate and the APC concentration can be finely tuned by changing the size of the sectored/rectangular shaped piece of the APC material while keeping the *RE*BCO target as the same [2]. The fine tuning of the APC concentration is very important from the point of view of the critical current performance being critically dependent on the APC concentration as investigated recently [3]. The schematic diagram of the surface modified target and the top view of the actual target being used are shown in figure 1.

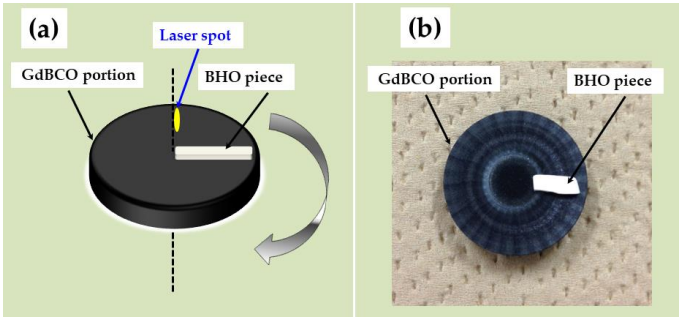

Fig. 1: (a) Schematic diagram of the surface modified target and (b) the top view of the actual target for making GdBCO+BHO nanocomposite films.

In this paper we discuss the fine tuning of BHO concentration by varying the size of the rectangular BHO piece on the GdBCO target and also varying the combinations of these surface modified pieces. Our recent experiment on GdBCO films with BHO nanoinclusions resulted in critical current properties considerably enhanced as compared to pristine GdBCO film which can be improved further by fine-tuning the concentration of BHO nanoinclusions.

References:

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