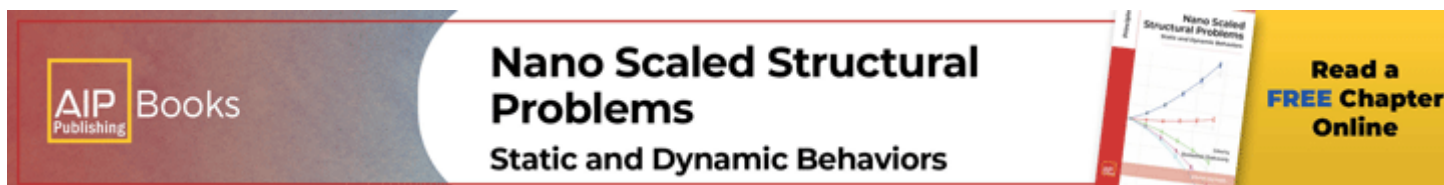




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# 10 to 25-fold increase in the transport superconducting critical current density of spark-plasma sintered Bi-2223 superconductors

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## ABSTRACT

Pre-reacted powders of  $(\text{Bi-Pb})_2\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_{10+\delta}$  (Bi-2223) were consolidated by using the spark plasma sintering (SPS) technique under vacuum and at two

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RESULTS INDICATE THE OCCURRENCE OF GRAINS WITH CORE  
shell morphology, where the shell is oxygen  
deficient. A post-annealing heat treatment (PAHT),  
performed in air, at 750 °C, and for a brief time  
interval, is responsible for a 10 to 25-fold increase in  
the transport superconducting current density at  
77 K. The role of the oxygen-deficient shell, before  
and after the PAHT, was investigated by means of  
magnetic and transport measurements. We argue  
that the PAHT is two folds: (i) it is responsible for  
the decrease of the width of the oxygen-deficient  
shell, then increasing the oxygen content along the  
grain boundaries; (ii) it promotes the formation of  
conduction current paths along the grain  
boundaries of the SPS material.

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