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## **M2Po2B-05 [36]: Flux Pinning Enhancements of Y-Ba-Cu-O Thin Films with Nanosize Magnetic Additions**

*Tuesday, July 23, 2019 1:30 PM (2 hours)*

Different methods of flux pinning are being tested world-wide to enhance critical currents ( $I_c$ s) of high temperature superconductor  $YBa_2Cu_3O_{7-x}$  (YBCO) coated conductors exposed to high magnetic fields. Magnetic materials are interesting to consider as flux pinning additions because of their potential for very strong pinning strength. To our knowledge, there have been limited demonstrations of magnetic pinning additions to YBCO conductors. This paper describes the study of different M magnetic phase additions to YBCO including M = BaFe<sub>12</sub>O<sub>x</sub>, La<sub>0.67</sub>Ca<sub>0.33</sub>MnO<sub>3</sub>, and other oxide phases. Nanosize additions were incorporated by depositing multilayer (M/YBCO)N films to minimize degradation of  $T_c$ , and testing volume % additions of M phase from 0.5 % to 5%. Results indicate that  $T_c$  onsets are depressed with magnetic additions, however in some cases interestingly without degrading the transition width. With optimization of magnetic additions a 50% increase of critical current density has been obtained, for low magnetic fields of < 1T at 65K to 77K. Microstructural and superconducting properties will be summarized, including SEM analysis.

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**Authors:** HAUGAN, Timothy (U.S. Air Force Research Laboratory); Mrs SEBASTIAN, Mary Ann (U.S. Air Force Research Laboratory)

**Presenter:** HAUGAN, Timothy (U.S. Air Force Research Laboratory)

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