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## Overview of Recent Progress in No-Insulation REBCO Magnet Research

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For the past few years, notable progress has been made in the no-insulation (NI) high temperature superconductor (HTS) magnet technology. *Electromagnetic* (thus fast) quench propagation, the key mechanism for the “self-protecting”, has been demonstrated in experiments of >100 NI modules and test coils, as well as various numerical simulations. Major drawbacks of the NI technique, including the intrinsic charging delay and non-linear electromagnetic behaviors, have been actively studied; variations of the NI technique together with complementary techniques have been proposed for performance improvement of NI magnets. This paper presents a brief overview of the recent progress in the NI REBCO magnet technology, which include: (1) a 11 T NI-REBCO insert that generated 42.5 T at a coil current density of  $1150 \text{ A/mm}^2$  in a bore of the 31 T resistive background magnet at the National High Magnetic Field Laboratory (NHMFL); (2) a 20 T all-superconducting magnet consisting of a 13 T NI-REBCO insert and a 7 T NbTi background magnet, which will be on service as the first user magnet in early 2017 at the Applied Superconductivity Center of the NHMFL; (3) partial and metal insulation approaches for faster charging and their “safe” operating conditions without losing the self-protecting feature; (4) active feedback control to mitigate the charging delay and non-linear behavior of an NI coil; (5) “defect-irrelevant” behavior of NI coils at 4.2 K and 77 K.

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