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## Further analysis of the mechanical and thermal properties of ice in the ice impregnated high temperature superconducting coils

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For mechanical reinforcement against the huge Lorentz forces in high magnetic fields, epoxy resins are commonly used to impregnate the high temperature superconducting (HTS) coils. However, performance degradation of the epoxy impregnated HTS coils is inevitable due to different thermal expansion coefficients between the epoxy resin and the HTS tape. The ice impregnation technique of pulsed magnets was applied to HTS coils for the first time in our previous study. Compared with the epoxy impregnated HTS coils, ice impregnated HTS coils showed almost no degradation in critical current after several thermal cycles. Besides, the ice impregnated coils had better thermal stability than that of the epoxy impregnated coils. The mechanical properties of ice were very important for studying the application of ice in the HTS magnets and rarely studied at 77 K. In this paper, uniaxial tension test, compression test and crack detection test of the ice specimens were conducted at 77 K. And ice mixed with substances such as, glassfiber and alcohol, were used to improve performance of ice. Thermal properties of ice were also measured in this paper. The results showed that ice had superior mechanical strength and thermal properties in the HTS coils.

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