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## Strengthening of a lithium disilicate glass-ceramic by rapid cooling

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### ABSTRACT

In order to improve the mechanical properties, a traditional physical strengthening process was applied to a lithium disilicate (LD) glass-ceramic with a dual-phase microstructure consisting of a glassy matrix and LD crystals. The strengthening process was based on the transformation behavior of the glass-ceramic. The process was conducted by heating the glass-ceramic to a temperature below the dynamic softening point, and then rapid cooling in silicon oil (quenching). Residual stresses and mechanical properties of the glass-ceramic were investigated after the quenching. It was found that residual compressive macro-stresses could be induced in the surface layer of the LD glass-ceramic by the quenching. The residual stresses remarkably increased with increasing the quenching temperature to near the dynamic softening temperature. Compared with the corresponding annealing state, the LD glass-ceramic could be effectively strengthened and toughened by the quenching at a suitable temperature. The results displayed the strengthening possibility and potential of the LD glass-ceramic by the traditional physical process.

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