

The Effect of Multiple Heat Firing Cycles on the Surface Hardness of a Nano-Lithium Disilicate CAD/CAM Material



INTRODUCTION

Nano-Lithium Disilicate CAD/CAM blocks are introduced with the ability to reach the desired translucency by firing at a specific temperature. Additional heat treatment cycles may be performed in order to lower the translucency of the restoration which may pose an adverse effect on the mechanical properties of the materials

The objective of this research was to evaluate the effect of multiple heat-treatment cycles on the surface hardness of lithium disilicate CAD/CAM material.

METHODS

Nano-lithium disilicate CAD/CAM blocks (Amber® Mill) (Fig. 1) were sectioned into rectangular-shaped specimens (n=15) (Fig. 2) with dimensions of 12.0 x 14.0 mm and 1.0 mm thickness (Fig. 3) and polished up to 600-grits of silicon carbide sandpaper. Each specimen was subjected to four firing cycles according to the manufacturer's instruction. After each firing cycle, surface indentation with a constant load of 1000-grams (9.807 N) and dwelling time of 15s was performed to measure the Vickers hardness (Fig. 4, 5). An image analyzer was used to measure the diameters of the indentation to calculate the hardness value (kgf/mm²).



Fig.1 Amber Mill lithium disilicate CAD/CAM blocks



Fig.2 Accutom-50 sectioning machine

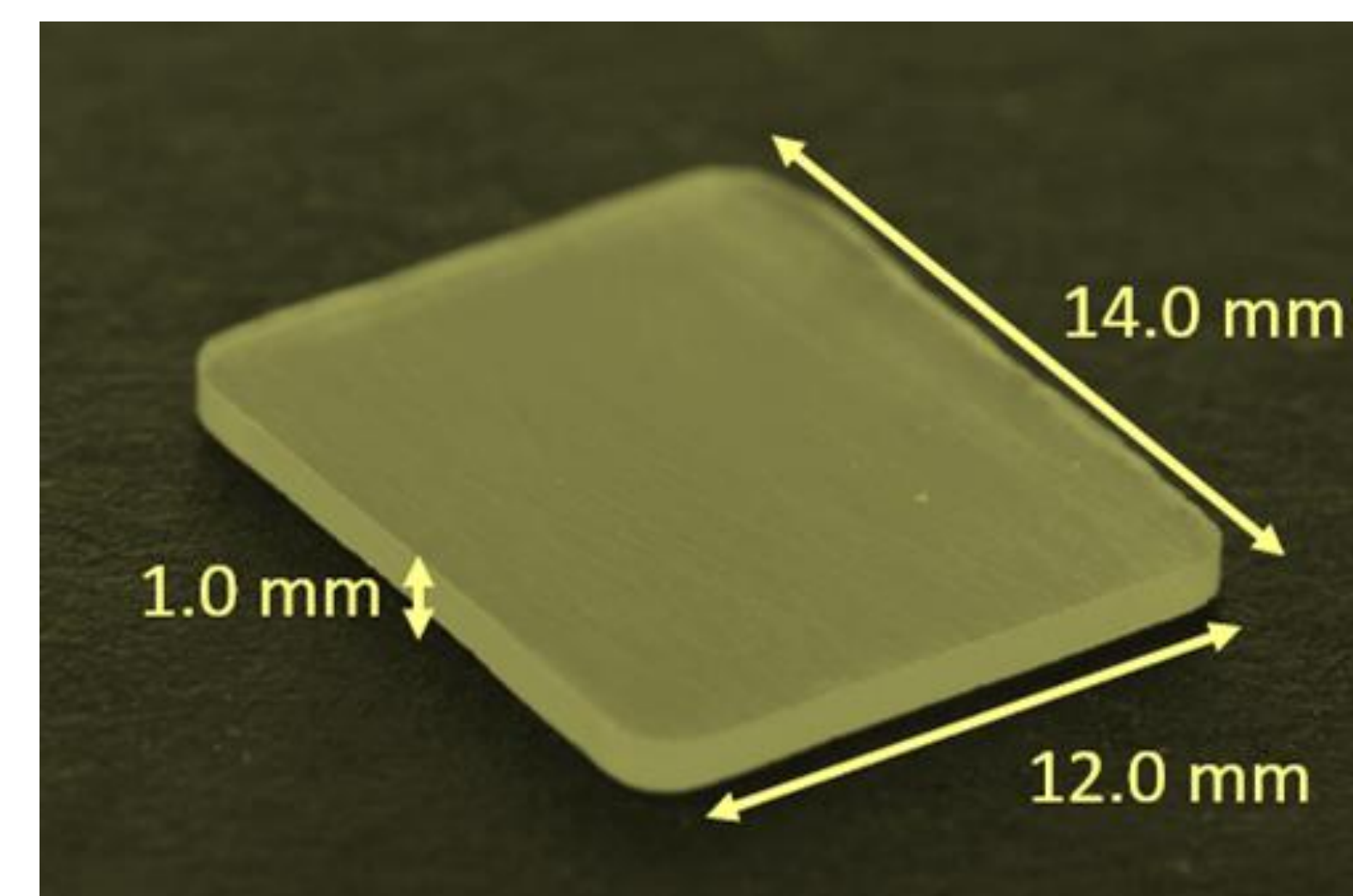


Fig.3 Samples dimension

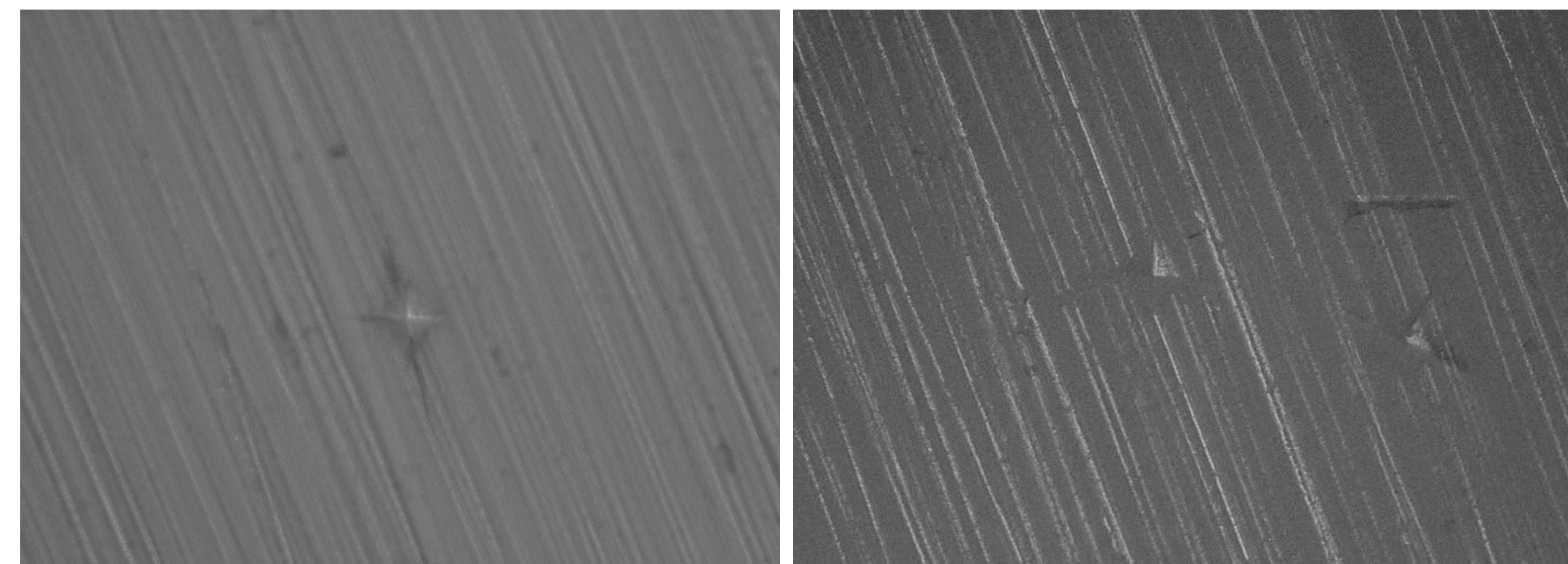


Fig.4 Surface Indentation with Vickers Hardness Test Machine

RESULTS

- The mean (sd) of hardness value was 211.58 (9.22), 183.51 (11.86), 177.29 (6.95), and 194.68 (5.31) for the first, second, third, and fourth firing cycle, respectively (Fig 5).
- According to the repeated measures (Wilk's Lambda) analysis, no significant difference was found between the groups in terms of hardness value (P=0.092).

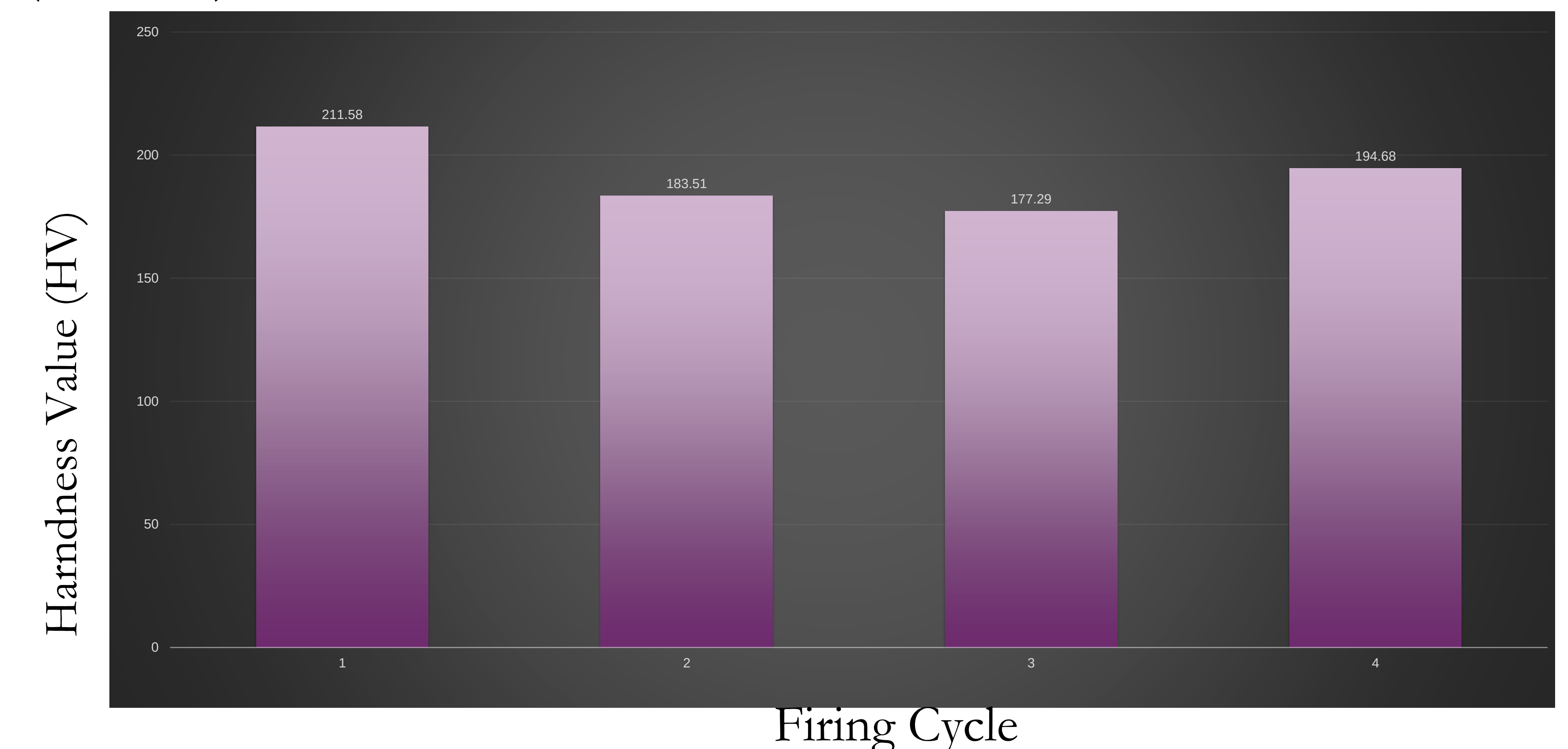


Fig.5 Graph showing the hardness parameters at different firing cycles

CONCLUSIONS

The tested material exhibited no significant changes in surface hardness following multiple firing cycles which may indicate the viability of this option in case of need to achieve a lower translucency for the restoration after initial crystallization.