

The Effect of Multiple Heat Treatment Cycles on the Translucency of a Nano- Lithium Disilicate CAD/CAM Material

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INTRODUCTION

A nano-lithium disilicate CAD/CAM block is available with the capability to provide different levels of translucency in a single block through different heat treatment cycles.

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

METHODS

- Nano-lithium disilicate CAD/CAM blocks (Amber® Mill) (fig.1) were sectioned into rectangular-shaped specimens with dimensions of 14.0 mm x 12.0 mm and 1.0 mm thickness using Accutom-50 sectioning machine (Struers, Cleveland, OH, USA)(fig.2 & 3).
- Specimens were polished with up to 600 grit silicon carbide sandpapers, cleaned in an ultrasonic bath containing distilled water for 15 minutes and dried using absorbent papers.
- Each specimen was then subjected to four different firing cycles according to the manufacturer's instructions. Samples were fired in Programat P700 furnace (Ivoclar Vivadent, Schaan, Liechtenstein) at 815°C, 830°C, 845°C, 865°C which corresponds to high translucency, medium translucency, low translucency and medium opacity respectively.
- After each firing cycle, a colorimeter was used to measure the CIE L*a*b* values of each specimen on a black background and a white background.
- Translucency parameter (TP) was then calculated using CIED2000 formula :

$$TP = [(L^*_b - L^*_w)^2 + (a^*_b - a^*_w)^2 + (b^*_b - b^*_w)^2]^{1/2}$$

where L* refers to the brightness, a* to redness to greenness, and b* to yellowness to blueness. The subscripts b refers to the color coordinates on the black background and w to those on the white background

- Statistical analysis was performed with significance set at 0.05.

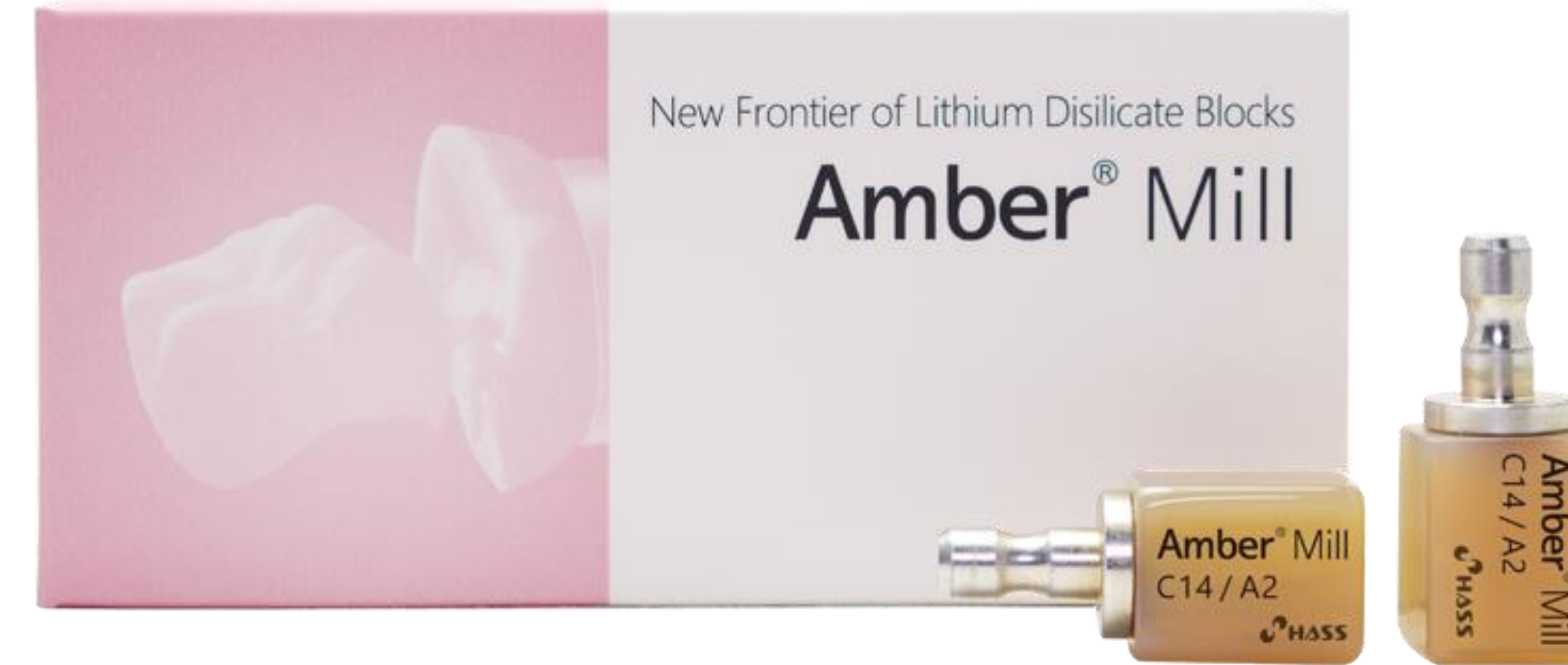


Fig.1 Amber Mill lithium disilicate CAD/CAM blocks

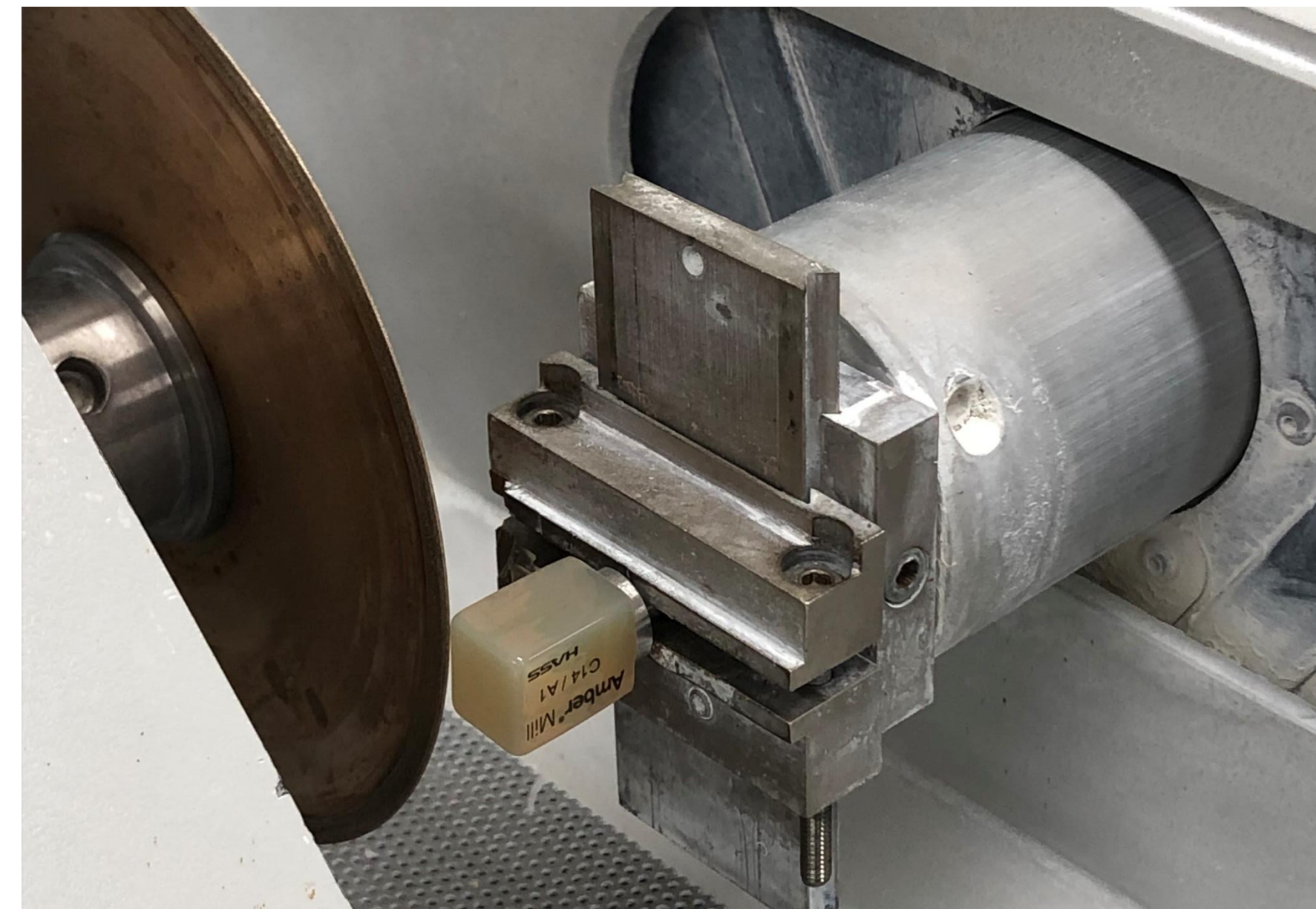


Fig.2 Accutom-50 sectioning machine

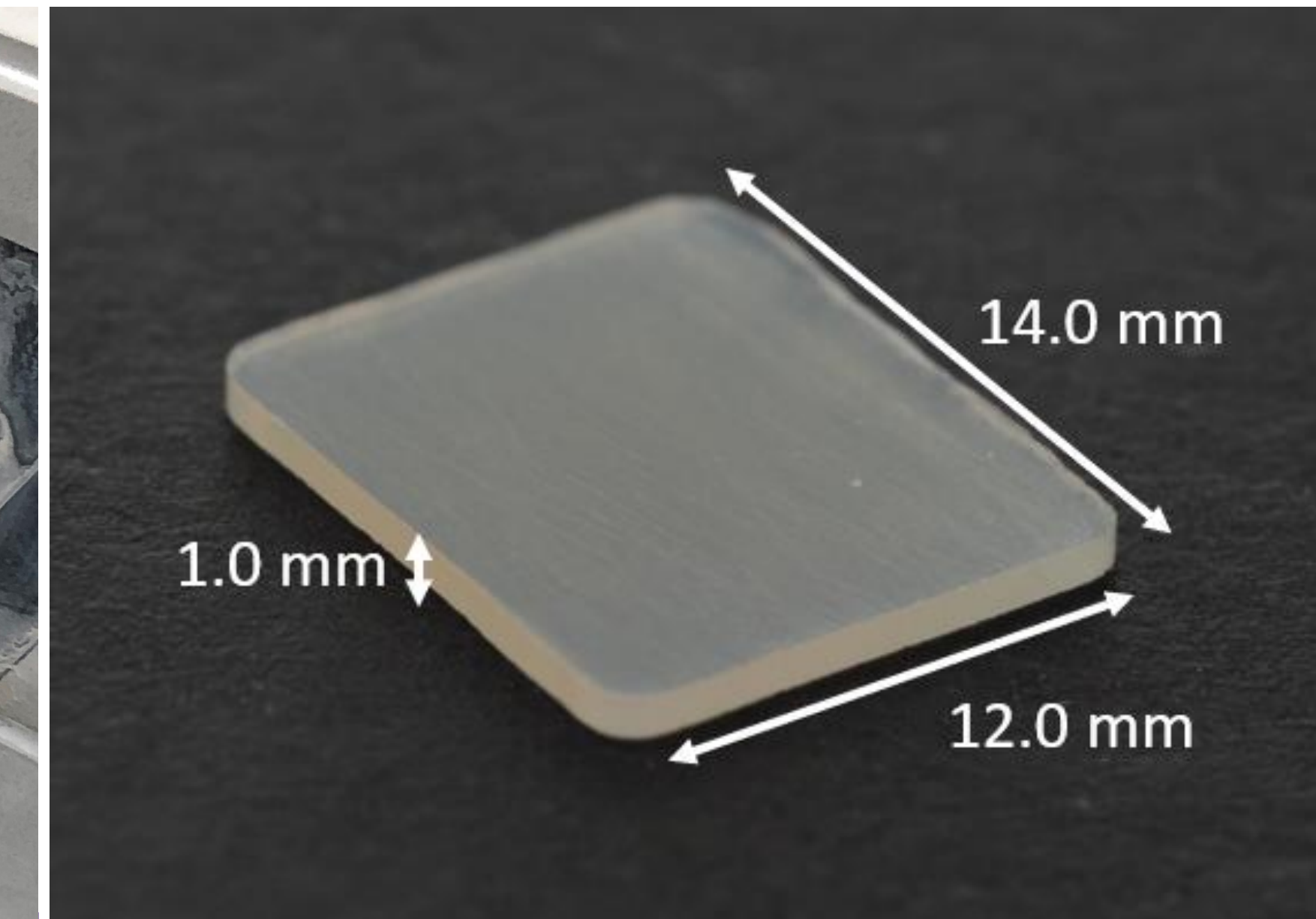


Fig.3 Samples dimension



Fig.4 Translucency of samples after firing, from left to right, non-crystallized, one firing cycle, two firing cycles, three firing cycles, four firing cycles

RESULTS

- The mean (sd) translucency parameters of the samples were 20.17 (0.08), 19.38 (0.1), 16.52 (0.13), and 12.22 (0.05) for the first, second, third, and fourth firing cycle, respectively. (fig.5)
- According to the repeated measures and Wilk's Lambda test, the changes in mean translucency parameter were statistically significant (P<0.001). Pairwise comparison revealed significant difference between each firing cycle (P<0.001).

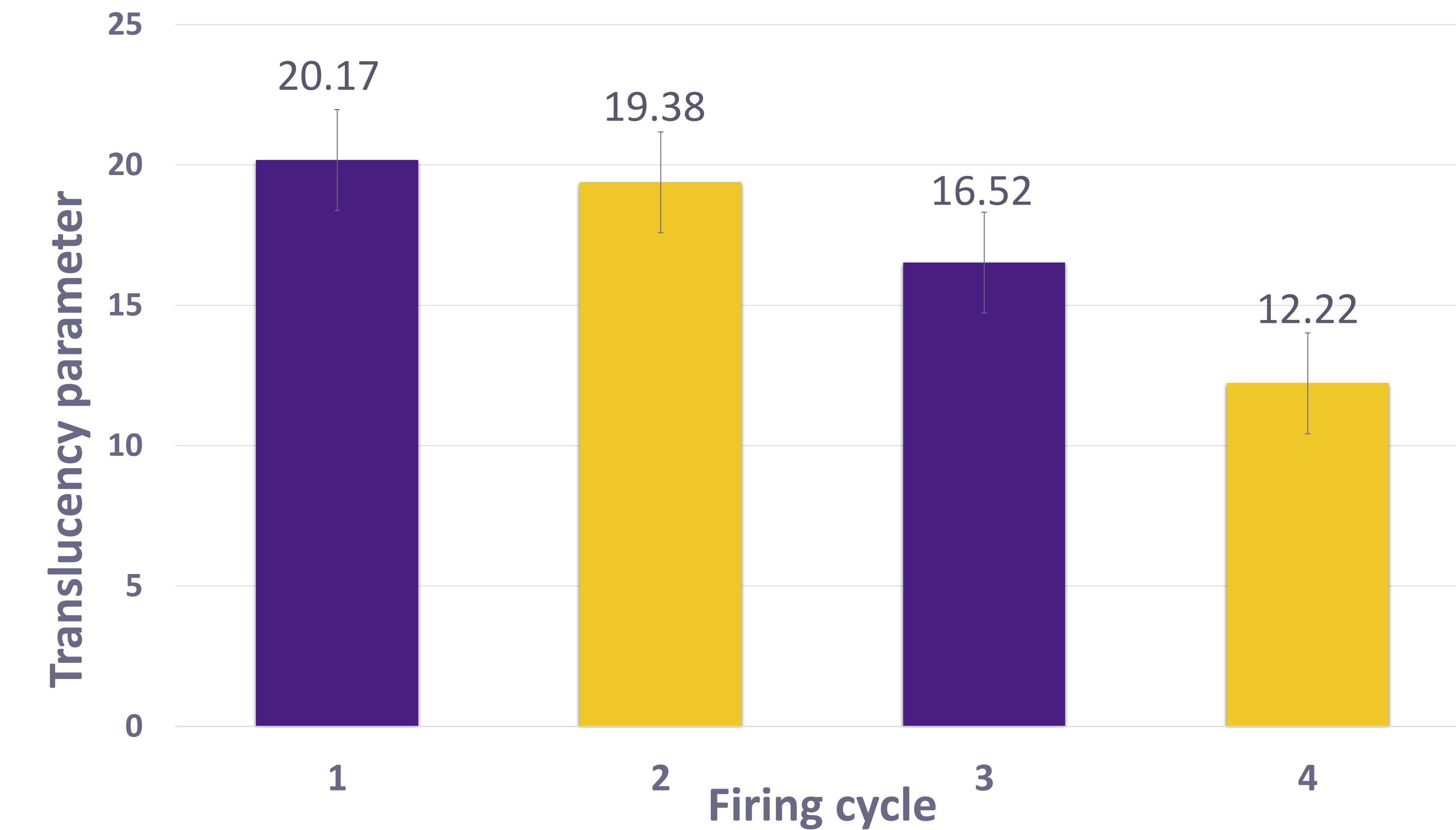


Fig.5 Graph showing the translucency parameters at different firing cycles

CONCLUSIONS

- The translucency of the tested nano-lithium disilicate changed following each heat treatment cycle.
- This feature enables clinicians to be able to modify the translucency of the same restoration if lower translucency would be desired.