

## The Effect of Mixing Method on the Properties of Alginate

In 1999 Cavex introduced the Cavex Alginate Mixer. Then, it was frowned upon as only being an extra and expandable cost addition. But more than 7 years later the Cavex Alginate Mixer is well accepted in the dentist and orthodontic practice and many of them will probably wonder how they ever did without.

### Advantages of mechanical mixing

When alginate is mixed manually the impression is as good as the technique and experience of the dentist or assistant. Unfortunately this often leaves much to be desired. By mixing mechanically, the impression will always be of a very high quality (despite the person mixing), done much faster and a lot less messy.

So it is not difficult to imagine that mechanical mixing is very efficient and easy. But regarding the claim that the quality of the alginate actually improves when mixed mechanically, until recently you had to take our word for this. However this has changed.

### Scientific research by ACTA

The ACTA (University of Amsterdam) has recently researched the influence of the mixing method used on the alginate characteristics; strength, porosity and elasticity.

In conclusion ACTA states:

**Mechanically mixed alginate is less porous, stronger and has a higher elasticity than alginate mixed by hand. This highly reduces the risk of tearing and deformation.**

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See underneath for full the report

### How does this benefit the dental professional?

In daily life the conclusion as mentioned above will translate into flawless impressions and a minimal chance of tearing. So you will dramatically reduce rework. In short; higher efficiency for the dentist - more comfort for the patient. But above all it should not be forgotten that mixing mechanically is just so very "convenient and easy".



## INTRODUCTION

Alginates are the most widely used impression materials in dentistry. The accuracy of the impression depends primarily on the quality of the alginate, the liquid/powder ratio, and homogeneity of the impression material. Rapid spatulation can give the alginate a "creamy" consistency, which can be achieved by high-speed rotary mechanical mixers.

## AIM

The aim of this study was to determine the effect of mixing method, manually versus mechanically, on the tear strength, porosity, compressive strength and E-modulus on Cavex CA37 (batch 060105) at different liquid/powder ratios.

## MATERIALS AND METHODS

Cavex CA37 was mixed mechanically (10s, Cavex Alginate Mixer) or manually 30s. Different liquid/powder ratios were evaluated; 25.0/14.0, 30.0/14.0 (= manufacturer's recommendation), 35.0/14.0, and 40.0/14.0.

The porosity was evaluated by determining the density, calculated from the weight and volume of 16 cylinders (h=10 mm,  $\phi$ 12,5mm) directly after setting.

To overcome influences from setting behavior on the strength the specimens were air-dried for two weeks at room temperature and 1 day at 55°C. The compressive strength was measured in a tensiometer (1.0mm/min)

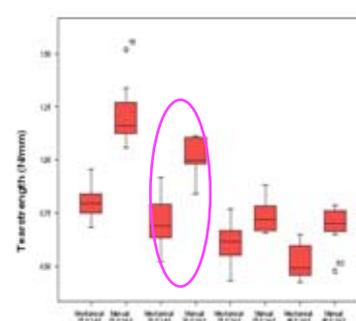
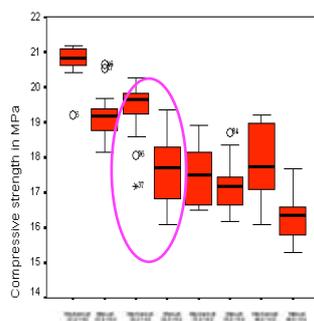
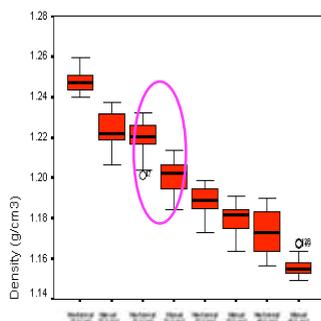
The tear strength was measured in accordance with ASTM D624, 5 minutes after the start of mixing with a cross-head speed of 500mm/min.

The setting time and E-modulus were evaluated in a tensiometer. During setting the cross-head moved up and down creating sinusoid stress-strain cycles (displacement =20 $\mu$ m, freq.=0.4Hz). From the curves obtained, the point of inflection in stress was used to determine the setting time, while the E-modulus was calculated ( $t=470s$ ) from the stress-strain cycles.



## RESULTS

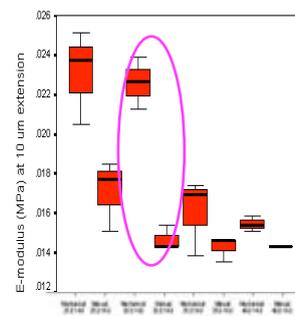
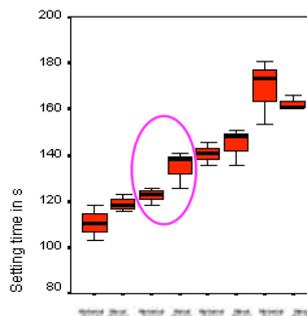
Significant differences ( $p < 0.05$ , ANOVA) were found between mechanically mixed and manually mixed specimens for the density, compressive strength and tear strength.



A linear relationship was found between the liquid/powder ratio and the setting time in both mixing methods.

No significant difference in setting time was found between mechanically and manually mixing.

In contrast, at liquid/powder ratio 25.0/14.0 and 30.0/14.0 (= recommended mixing ratio, indicated with circle) significant difference was found in E-modulus between mechanically mixed and manually mixed.



## CONCLUSION

Mechanically mixed specimens are denser, stronger, and have a higher E-modulus compared to the manually mixed specimens. Clinically mechanically mixed samples will have higher strength and lower chance to deform.