Aging of zirconia (zirconium dioxide) based materials is associated with surface structural changes caused by humidity at elevated temperatures. Tetragonal phase is the stable structure of zirconia at the sintering temperature. Yttria, magnesia or other oxides are added to zirconia materials to maintain this favorable crystalline form also at room temperature. With variable temperatures in the mouth, catalyzed by humidity, the structure at the surface will slowly transform to a monocline phase. A tetragonal to monocline phase transformation is assumed to reduce the bond strength between zirconia cores and veneering ceramics. This transformation is also regarded as detrimental to monolithic zirconia prostheses or implants due to the volumetric expansion of the crystals at the surface.

A study of the strength was performed for three different materials designed for different sintering techniques after artificial aging with an accelerating aging method. Discs of these materials were immersed in hot, 80 °C, acetic acid solution with eccentrically movement for one week to simulate many years of clinical service. The results showed that the materials still remain a high strength. However, despite of negligible solubility, the biaxial flexure strength was reduced by 100 to 200 MPa for all materials.

The specimens were made from blocks intended for computer aided design and manufacturing, CAD/CAM. Two of the materials were yttria stabilized tetragonal zirconia polycrystalline, Y-TZP, one milled in presintered condition and thereafter dens sintered, the other HIPed (hot isostatic pressed).

The third material was dens sintered, magnesia partial stabilized zirconia, Mg-PSZ. A correlation of dissolution and strength data may be of clinical importance for the long-term outcome of FPDs.

The HIPed Y-TZP material had the highest strength values, but the least reliability (Weibull modulus). The milling procedure of the dens sintered material seemed to have created a secondary fracture mechanism, probably caused by microcracks at the surface resulting in lower values for some of the specimens. The Mg-PSZ exhibited the lowest strength, but the highest reliability.

The full article can be found here:
HET-CAM TEST

HET-CAM test (hen’s egg-chorioallantoic membrane test) is a test used to determine the irritation potential of substances and is an alternative test to the Draize Rabbit Eye Test. In the test, incubated hen’s eggs are opened carefully on day 9 and the chorioallantoic membrane (CAM) is exposed.

Test substances, pure or diluted solutions, are placed directly on the exposed CAM-membrane (fig.1), and the membrane is inspected visually through a microscope. Time for reaction to occur on the membrane is recorded during a 5 min period. The reaction outcomes are haemorrhage (fig.2), coagulation and lysis. Based on the reaction time an irritation score, IS, (Kalweit et al., Toxicol in vitro 1990;4:702-4) is calculated and the substances are classified on the basis of the value of the score. Test solutions scoring 0–0.9 are classified as non-irritative, score 1–4.9 as slightly irritative, score 5–8.9 as moderately irritative and score 9–21 as strongly irritative.

NIOM has used the test method to evaluate different substance used in dentistry such as extracts from different dental restorative materials, dental adhesives and primers, substances in toothpaste and hydrofluoric acid (HF). The HET-CAM test showed that HF concentration 0.05 % was slightly irritative, 0.10 % moderately irritative and 0.20-1 % strongly irritative. In dentistry, HF is mainly used as a component for etching of ceramics and if spilled on soft tissue it can give severe injuries. In a recent study the HET-CAM test showed that HF combined with potassium fluoride (KF) to potassium hydrogen difluoride (KF·HF) reduce the irritation potential considerably.