NIOM
Nordic Institute of Dental Materials

NEWSLETTER
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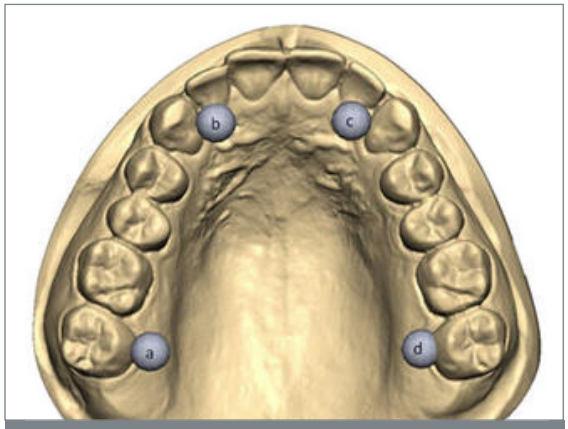
NEW STANDARD FOR DIGITAL IMPRESSIONS

CAD/CAM and 3-D printing have arrived with full force in dentistry. NIOM is leading the work to secure standards for scanning accuracy.



Proposed model for testing the accuracy of full-arch scans.

NIOM leads the ISO working group responsible for the development of a new standard: *Methods for Assessing the Accuracy of Hand-Held Scanning Devices for Digital Impressions.*

With the increased use of 3D printing in dentistry, focus falls on the accuracy of the digital impression from which all prosthetic design begins. A digital impression is a virtual model of a patient's dentition, obtained either indirectly by scanning a traditional gypsum model or directly with an intra-oral scanner.

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The confines of the oral cavity limit data acquisition and impose uncertainties on digital registration. The digital impression may become unacceptably inaccurate when scanning for a large prosthesis.

Intra-oral scanners work with a variety of technologies, but with a number of common features:

- Acquisition of a sequence of data frames with the surface topography seen by the scanner
- Registration of the areas of overlap between the frames to deduce the motion of the scanner
- Rendering of the topography into formats suited for appliance design and manufacturing

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At present, the ISO working group led by NIOM has prepared a draft for the development of the standard and welcomes comments and feedback via the ISO balloting system. We urge interested dentists and manufacturers to contact their national standardization body for draft details and to submit comments. **The deadline for comments is April 13, 2017.**

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NEW HIGH SENSITIVITY ANALYTIC INSTRUMENT AT NIOM

NIOM has recently acquired a high sensitivity ultra-high performance liquid chromatography mass spectrometry (UHPLC-MS) instrument (Figure 1). The new UHPLC will allow better separation of components in much shorter time compared to our old HPLC and the triple quadrupole MS will allow quantification of substances present in very small amounts (picogram-femtogram range). NIOM is very excited to have this instrument in-house and looks forward to exploring its use in a range of applications.

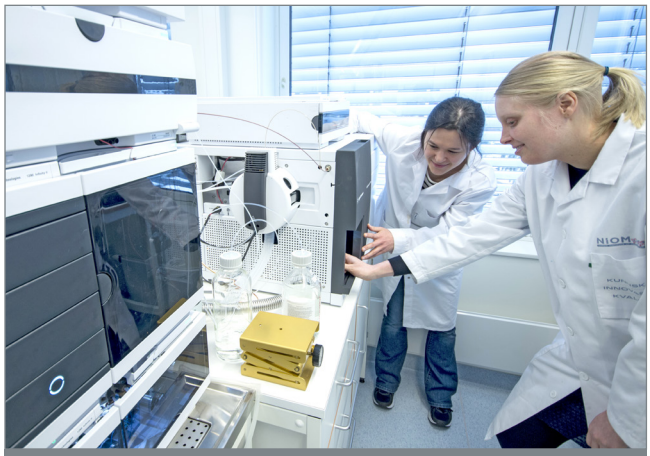

Figure 1. The new UHPLC-MS system.

UHPLC-MS is used in a range of scientific disciplines, such as the pharmaceutical industry, forensics, food and materials science, to detect and quantify substances in solution. This combined analytical technique works by separating the components, e.g. according to polarity, in the liquid phase (UHPLC) before they are injected in the mass spectrometer (MS). In the MS the components of interest are ionized to charged particles and are separated in the gas phase according to their mass-to-charge (m/z) ratio.

The curing of resin-based dental materials is never complete. These complex materials may leach unreacted components, as well as additives, degradation products and contaminants into the oral environment. The concentrations of the leaching components are often very low, but the high sensitivity of the new MS will allow detection and quantification of the leaching components, eg. methacrylate monomers and bisphenol A (Figure 2), at very low concentrations. Assessing the extent of leaching from different materials is an essential part of NIOM's activities and UHPLC-MS is therefore an important tool for improving patient safety.

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The methacrylate-based monomers in dental materials have been shown to affect cells in vitro by reducing cell growth. However, the mechanisms through which this process occurs are not fully understood. Research projects at NIOM are currently focused on elucidating these mechanisms through the use of mass spectrometry to study interactions between the dental monomers and proteins in cells. In the long run, the new UHPLC-MS instrument will thus provide information that can be used to improve the biocompatibility of resin-based dental materials.

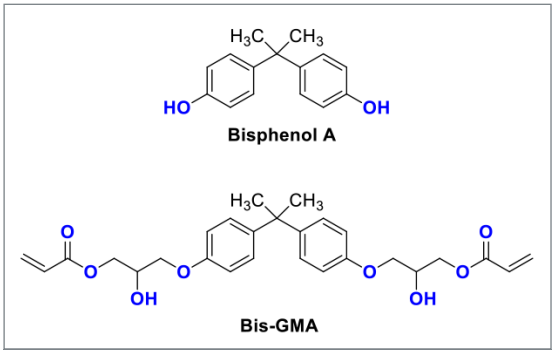

Figure 2. Leaching components, bisphenol A and Bis-GMA.

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KNOWLEDGE – INNOVATION – QUALITY

The Nordic Institute of Dental Materials (NIOM) is responsible for promoting a continuing Nordic collaboration in the field of dental biomaterials. NIOM maintains a distinct Nordic profile through broad contacts with the Nordic dental educational institutions and research centres. The Institute undertakes research, materials testing, standardisation and research-based consulting directed towards health authorities and dental health services in the Nordic countries. Our research and consulting are required to be scientifically founded and applicable to clinical dentistry.