用橡胶类胶进行牙科石模型的多材料 3D 打印
医疗和牙科解决方案的负责人 Avi Cohen 解释了用刚性和柔性材料的组合打印石模型的出色精度。

Multi-Material 3D Printing of Dental Stone Model with 'rubber-like' gum

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When inserting a fabricated crown or bridge, into a digital printed stone model (traditionally, gypsum model), the dental lab technician is required to ensure it fits to the margin line prep made by the dentist based on the patient's actual teeth.

In addition, when placing a crown into a hard material die and stone model – the dental lab technician ignores the real life need for the crown to be inserted actually into and under the gum line, as indicated in **Figure 1**.
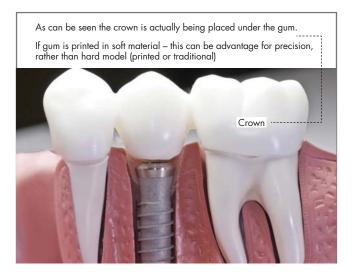
Since to date there were no hard\soft combination stone models, such level of realism was not feasible. The solution described herein overcomes the significant limitations of traditional fabrication or single material digital printing.

Using a multi material solution such as described herein, instead of (or in addition to) having the die fabricated in two colors by SFF, the same multi-material system (e.g. Objet Geometries Ltd.'s Connex multi material – digital material system) can print the gums in a completely different material to the material used to fabricate the other 'boney' regions. For example, the regions digitally representing the patient's gums can be printed in a softer, flexible, rubber-like material, e.g. TangoBlack (Objet Geometries Ltd., Israel), and the boney-dental regions printed in a harder, non-flexible material, e.g. VeroWhite (Objet Geometries Ltd., Israel) such that the final model very closely resembles the real life 'mouth' upon which it is representing, as graphically illustrated in **Figure 2**.

Thus, fitting the new crown on the stone model die with simulated flexible 'gums', i.e. rubber-like regions, provides a close simulation of the physical effect and characteristics of the patient's own gums and thus enables a subsequent more accurate and comfortable fit in the patient's mouth. Such a model provides a realistic and life-like example and tool, for ensuring that the crown is 'sitting' properly on the die and beneath the patient's gum line, hence, a better fit for the patient's mouth.
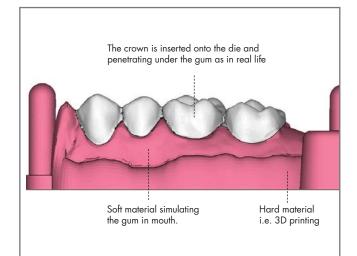
As can be seen the crown is actually being placed under the gum.

If gum is printed in soft material – this can be advantage for precision, rather than hard model (printed or traditional)

Crown

Figure 1

The crown is inserted onto the die and penetrating under the gum as in real life

Soft material simulating the gum in mouth.

Hard material i.e. 3D printing

Figure 2

ABOUT OBJET

Objet Ltd., is a leading provider of high quality, cost effective inkjet-based 3D printing systems and materials. A global company, Objet has offices in North America, Europe, Japan, China, Hong Kong, and India.

Objet's 3D printing systems and 3D printing materials are ideal for any company involved in the manufacture or design of physical products using 3D software or other 3D content. Companies using Objet's solutions can be typically found in sectors such as consumer goods & electronics, aerospace & defense, automotive, education, dental, medical and medical devices, architecture, industrial machinery, footwear, sporting goods, toys and service bureaus.

Founded in 1998, the company has thousands of customers worldwide including a substantial share of the relevant Fortune 100 and Fortune 500. Its award-winning technology (12 awards in 5 years) is based upon over 110 patents and patent pending inventions.

Objet's advanced 3D printing systems and range of over 60 materials enable professionals to build prototypes that accurately simulate the true look, feel and function of an end-product, even complex, assembled goods.

The Objet Connex™ line of multi-material 3D printers features the world's only technology to simultaneously jet 2 materials. With this, users can print many different materials into a single part and print various mixed parts on the same build tray. Users can also create advanced composite materials, or Digital Materials™ featuring unique mechanical and thermal properties. Objet's range of over 60 3D printing materials simulate properties ranging from rigid to rubber-like, transparent to opaque and standard to ABS-grade engineering plastics, with a large number of in-between shore grades and shades.

Objet's 3D printers are available in a range of form-factors, from cost-effective desktop 3D printers ideal for entry-level professionals all the way to industrial-scale multi-material machines for front-line designers and top manufacturers. Objet's 3D printers feature the industry's highest-resolution 3D printing quality, based on 16-micron (0.0006 in.) super-thin layering, wide material versatility, office friendliness and ease of operation.

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