

Microtechnology to taste – holographic chocolate for the supermarket

Veronica Savu^{1,2} Vaida Auzelyte,^{1,2} Victor J. Cadarso¹

¹*Morphotonix, Chemin de la Raye 13, 1024 Ecublens, Switzerland*
Veronica.savu@morphotonix.com

Juergen Brugger²

²*Microsystems Laboratory, EPFL, 1015 Lausanne, Switzerland*

The highly saturated and fragmented chocolate market is driven by the need to differentiate through innovation. Morphotonix¹ has developed a technology enabling the fabrication of additive-free chocolate with holographic effects at industrial scale. This innovative solution is based on obtaining a micro-patterned surface of the chocolate, which acts like a diffraction grating (Fig. 1, 2). The micro-patterns are replicated from the chocolate polycarbonate molds, which in turn are fabricated from the metallic master mold via injection molding or thermo-forming (Fig. 3).

We optimize the micro-structure profiles for obtaining the most intense color effects balanced with a long shelf life. For linear gratings with periods below 3 μm , the chocolate roughness is of the same order of magnitude as the pattern size, thus the color intensity is weak and not long-lived. The typical European 20 μm chocolate particles mold into larger-size gratings with a greater signal-to-noise definition, which leads to a brighter holographic effect and longer shelf life. As cocoa butter has 6 different crystallization forms, the control of its crystallization greatly affects the properties of the final chocolate. The chocolate molding and cooling parameters are factors to be optimized in a chocolate production process for optimum micro-molding.

As a precision-engineering Swiss start-up from EPFL, Morphotonix has been successfully developing the industrially-compatible technology for micro-moulding of chocolate for the past two years. Bringing holographic chocolate from the cleanroom experiments to market shelves is made possible by close and dedicated collaboration among micro-technology innovators, industrial mould professionals and chocolate experts. Morphotonix is also applying its expertise in master mould micro-patterning and micro-injection moulding to provide innovative solutions for decorative packaging and brand protection in a variety of polymeric article markets.

¹ www.morphotonix.com

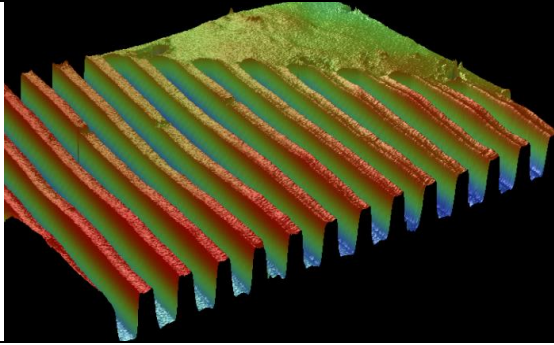


Figure 1: Optical profiler image of master for injection molding, linear grating $5\mu\text{m}$ period, $1\mu\text{m}$ deep, bordering flat region

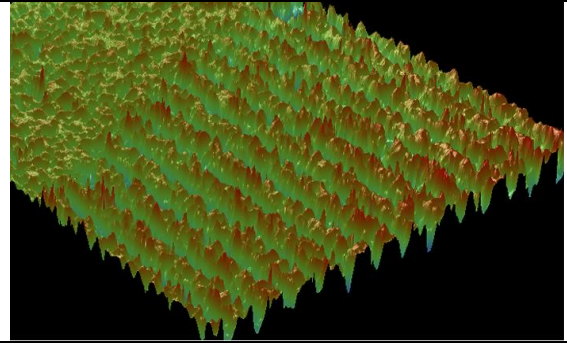


Figure 2: Optical profiler image of chocolate, linear grating $5\mu\text{m}$ period, $0.5\mu\text{m}$ deep, bordering flat region

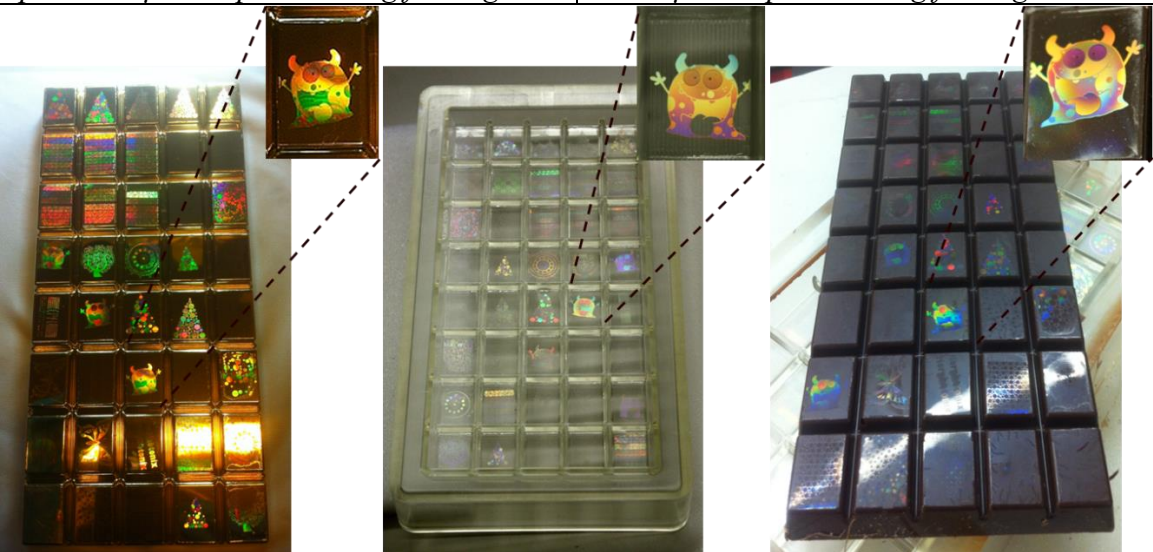


Figure 3: Left: injection molding master with micro-scale patterned images: Centre: polycarbonate chocolate mold; Right: black holographic chocolate