Final Report

Project acronym: *LaMoFlo*

Project number*: 7205*

M-ERA.NET Call 2019

Period covered: 01/06/2020 to 31/08/2023

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Publishable project summary

A frequent problem with packaging is the final stage of emptying these containers. There would therefore be an interesting environmental gain in emptying such containers completely. Of similar importance is the need for sustainable waste packaging and for easy emptying waste containers. Non-stick, self-draining containers would therefore be a welcome innovation that was investigated in the LaMoFlo project.
Researchers from McGill University, École de Technologie Supérieure (ÉTS) and the Laser Institute of Mittweida University of Applied Science (LIM) teamed up with a world-class manufacturer of bulk and food packaging (IPL) and a leading manufacturer of plastic injection molds (Moulexpert) with goal to develop an industrially viable process for laser texturing of molds for the production of functionalized polymer surfaces. A secondary goal was to test and enhancement of the developed functional microscopic structures for use in easy-flow and self-emptying plastic containers. Starting at TRL 4 the technology was pushed to TRL 6 at the end of the LaMoFlo project.
To reach this ambitious project goals, specifically we have (1) fundamentally evaluated the flow relationship of polymers on microscopic structures laser textured on mold steel at micro and nanoscale level through rheological studies, we (2) established a machining protocol for the laser texturing of the mold surfaces with functional microscopic features intended for damage-free molding and demolding of container sidewalls in order to provide the desired self-cleaning functionality on polymer parts, we (3) evaluated the infusion of lubricants (SLIPSS) into textured polymer surfaces for the manufacture of robust, slippery and self-healing container walls, we (4) brought laser texturing of mold surfaces from laboratory to industrial scale by scaling up processing speed and throughput, and we (5) laser textured a real-world injection mold provided by the industrial partners. Finally, the laser textured mold was used in industrial environments to validate the reliability of the molding process and further to demonstrate the benefit of functionalized plastic surfaces in every-day applications. The results obtained in LaMoFlo are of direct value to industrial partners, who can now contact laser technology manufacturers or sub-contractors to texture molds as required by industry.