UNIVERSITY COLLEGE DUBLIN

MNMT-DUBLIN

Tribo-Texturing by Micro-Abrasive Jet Direct Writing

Background

Tribological surface texturing is an emerging approach to reduce friction and wear of bearing parts. The approach can be employed in fabrication of 1 – 10 µm deep and 100 – 500 µm wide channels and holes on frictional surfaces. Productive and cost-effective fabrication of such features on freeform surfaces made of difficult-to-cut materials is a current manufacturing challenge.

Industrial demands

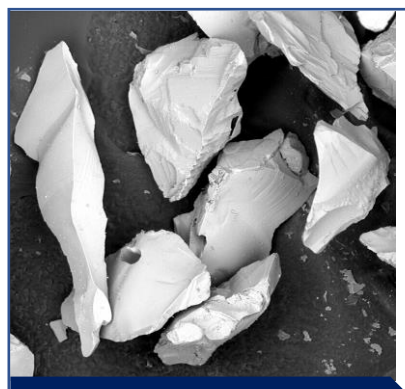
Artificial articular joints, primarily failing due to friction-induced wear, shown excellent performance when upgraded with tribological micro-texture. Hectares of tribo-texture would need to cover the annual consumption of knee and hip joints.

New method

MNMT-Dublin has developed a single step non-contact tribo-texturing technique based on further miniaturization of micro abrasive jet machining process. In this technique, a 200-µm nozzle with micron-particles is used as an erosion pencil subtracting a shallow (1 – 10 µm) track on freeform surfaces of any material.

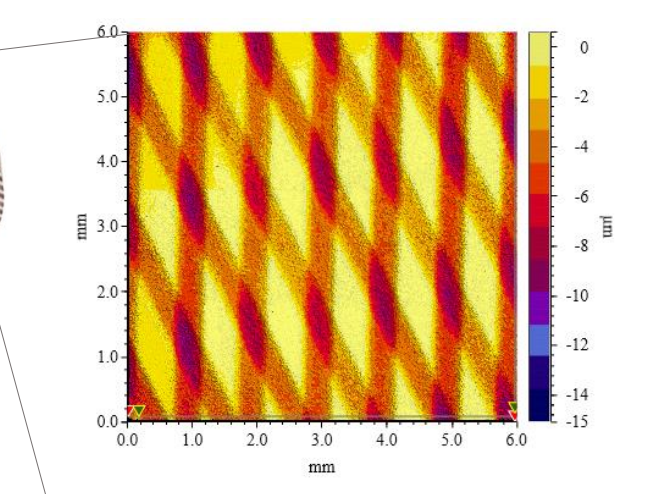
Progress and results

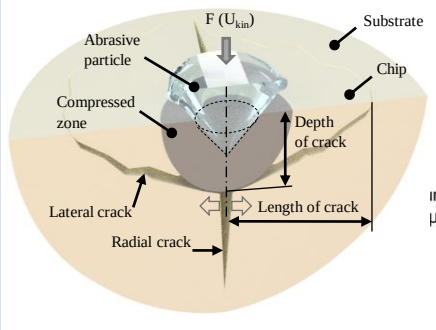
Experiments show that the hip or knee joint can be covered by micro-channels within a few minutes using only one nozzle and one gram of abrasives without the patterning masks. Current theoretical analysis forecasts the possibility to reduce the width of mask-less micro-channel below 100 µm, without the loss in process productivity.



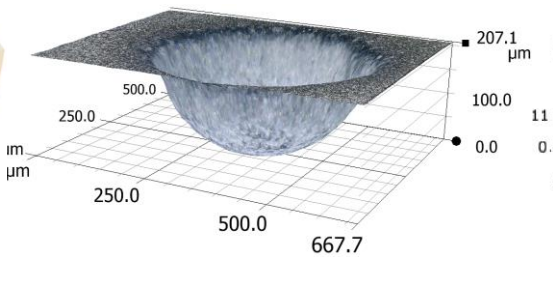
Micro-powder

Powder-blasting

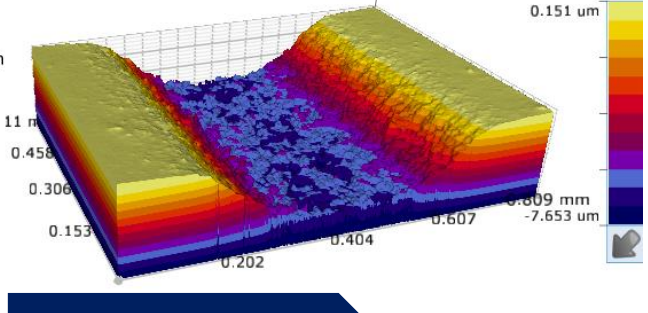




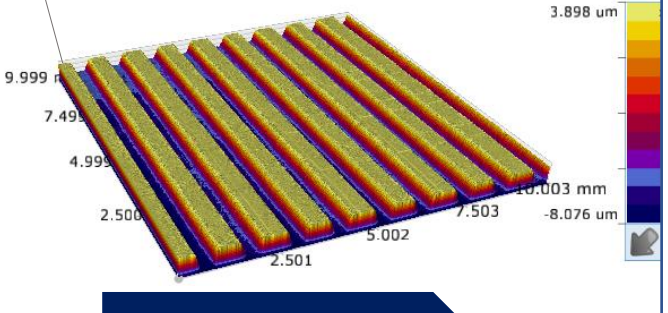
Micro-crater



Micro-hole



Micro-channel



Tribo-texture

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