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An Investigation of Surface Texturing by Ultrasonic Impingement of Micro-Particles

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Abstract : Surface topography plays a significant role in the functional performance of engineered parts. It is important to have a control on the surface geometry and understanding on the surface details to get the desired performance. Hence, in the current research contribution, a non-contact micro-texturing technique has been explored and developed. The technique involves ultrasonic excitation of a tool as a prime source of surface texturing for aluminum alloy workpieces. The specimen surface is polished first and is then immersed in a liquid bath containing 10% weight concentration of Ti6Al4V grade 5 spherical powders. A submerged slurry jet is used to recirculate the spherical powders under the ultrasonic horn which is excited at an ultrasonic frequency and amplitude of 40 kHz and 70 µm respectively. The distance between the horn and workpiece surface was remained fixed at 200 µm using a precision control stage. Texturing effects were investigated for different process timings of 1, 3 and 5 s. Thereafter, the specimens were cleaned in an ultrasonic bath for 5 mins to remove loose debris on the surface. The developed surfaces are characterized by optical and contact surface profiler. The optical microscopic images show a texture of circular spots on the workpiece surface indented by titanium spherical balls. Waviness patterns obtained from contact surface profiler supports the texturing effect produced from the proposed technique. Furthermore, water droplet tests were performed to show the efficacy of the proposed technique to develop hydrophilic surfaces and to quantify the texturing effect produced.

Keywords : surface texturing, surface modification, topography, ultrasonic
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