Surface wear of TiN coated nickel tool during the injection moulding of polymer micro Fresnel lenses

Limited tool life of nickel mould inserts represents an issue for the mass-production of polymer optics with complex micro three-dimensional geometries by injection moulding. TiN coating was applied to a nickel insert for the injection moulding of polycarbonate micro Fresnel lenses. Surface wear was monitored at different intervals during production on different tool locations. 3D micro optical dimensional microscopy, surface replica technique and SEM–EDS were employed to characterize wear of the micro features. Results showed wear decreasing at higher distance from the gate. After 24,500 moulding cycles the measured height reduction of 23μm high ribs was on the order of 400–1000nm.

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