

# Defect-free replication of polymeric micro structures using novel Ni-PTFE nanocomposite moulds

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KEYWORDS: Nanocomposite mould, defect-free production, micro injection moulding, demoulding force, PTFE nanoparticle

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*Demoulding defects like pile up plastic deformation and damage has constrained the quality of mass production of plastic micro products, such as microfluidic chips and optical gratings. A high-performance Ni-PTFE nanocomposite mould was fabricated for defects-free demoulding along with quantitative measurement of demoulding force. The Ni-PTFE nanocomposite mould performance was compared with pure Ni mould in terms of demoulding feature integrity, demoulding force, friction, wear and surface adhesion. Results consistently show that Ni-PTFE nanocomposite mould give profound surface integrity of microstructures with significant reduction of demoulding forces under various experiment conditions; the composite mould also displays 38% reduction in friction coefficient, while 5 times extended tool life, much less tool wear and adhesion compared to pure Ni mould. These micro injection moulding processes validated the self-lubrication properties of the Ni-PTFE nanocomposite mould for defect-free production of polymeric micro surface structures.*

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