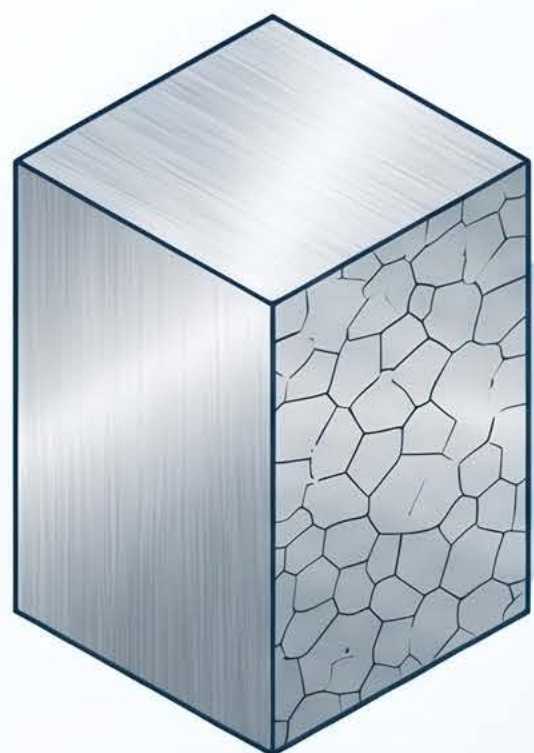


Optimising Al7075: The Impact of Nano-TiC Reinforcement

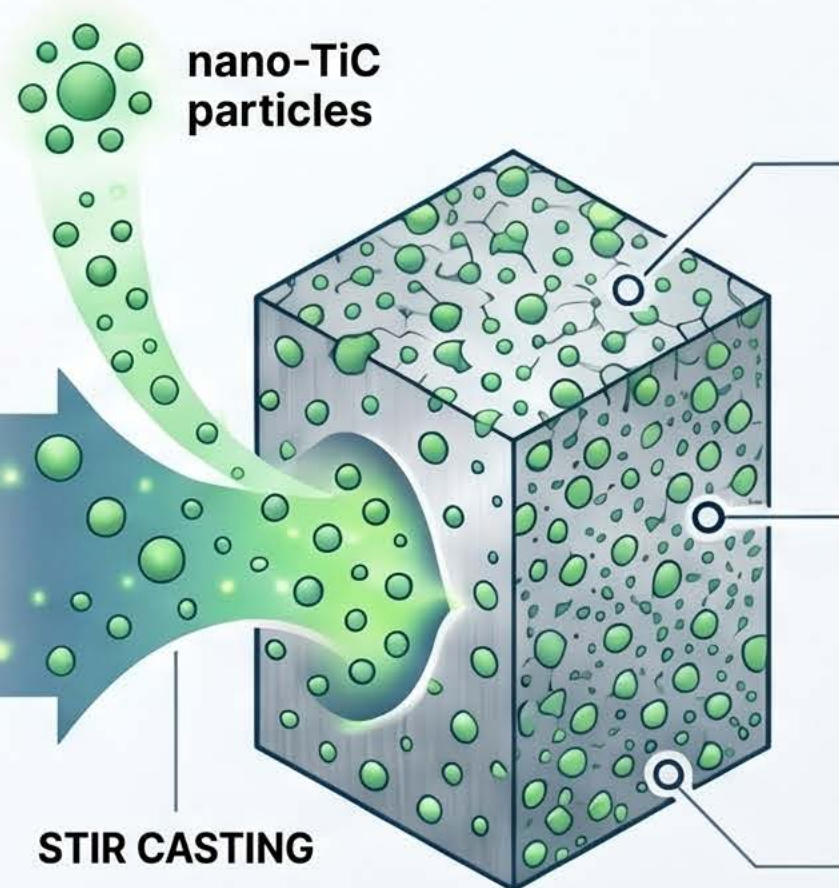
BASE ALLOY

Al7075



Hardness: 65 VHN
Tensile Strength: 130 MPa
Wear Loss: 0.092 g

THE 3% "SWEET SPOT" FOR PERFORMANCE



28.57%
Increase in Hardness
Reinforcing the matrix with 3% n-TiC raises micro-hardness from 65 to 91 VHN.

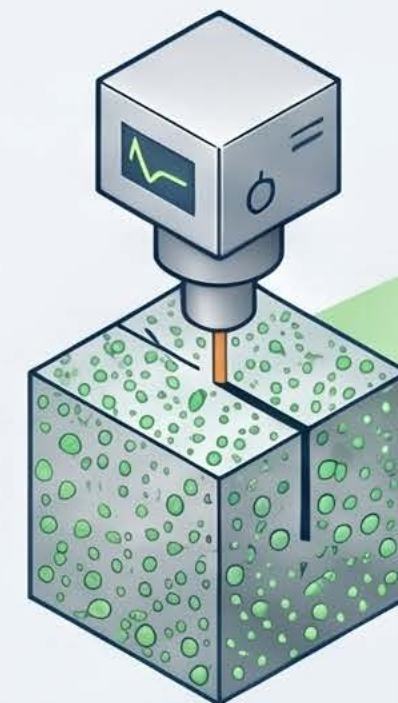


24.41%
Boost in Tensile Strength
Ultimate Tensile Strength (UTS) peaks at 172 MPa before decreasing at higher reinforcement levels.



33.69%
Better Wear Resistance
Nano-particulates prevent dislocation movement, significantly reducing the material wear rate
Wear Loss: 0.061 g

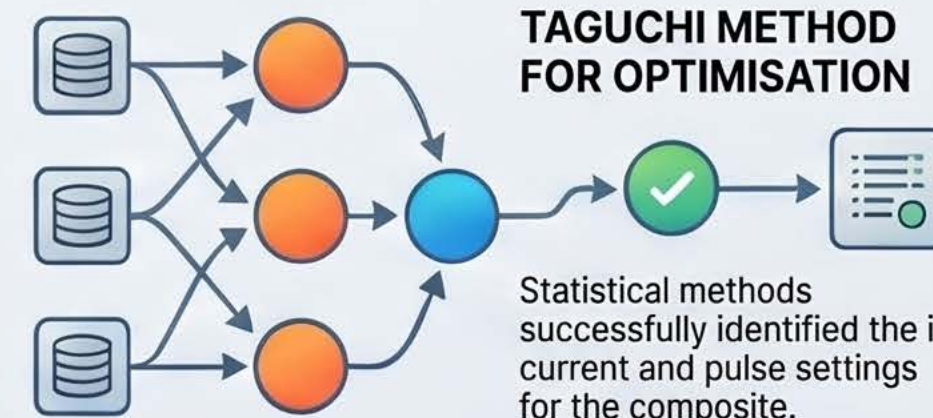
OPTIMISING MACHINABILITY (WEDM)



PULSE ON TIME IS THE CRITICAL FACTOR



47.01%
Impact on Material Removal Rate



| n-TiC Reinforcement (%) | Hardness (VHN) | Tensile Strength (MPa) | Wear Loss (g) |
|-------------------------|----------------|------------------------|---------------|
| 0% (Base Alloy) | 65 | 130 | 0.092 |
| 3% (Optimal) | 91 | 172 | 0.061 |
| 4% (Agglomeration) | 86 | 165 | 0.065 |



THE RISK OF PARTICLE AGGLOMERATION:
Adding 4% n-TiC causes clustering, creating flaws that reduce strength and hardness.