

Surface and Tribological Properties of Powder Metallurgical Cp-Ti Titanium Alloy Modified by Shot Peening

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1. Wear rate calculations

The percentage change of wear rate in shot-peened materials reported in the literature were calculated according to their corresponding wear rate, mass loss, and volume loss values Table 1 outlines the available literature on tribological properties of shot-peened materials, including the materials utilised, shot peening methods and parameters, and tribological testing methods and parameters.

Table 1. Wear rate improvement of the present study and literature studies.

Rf.	Shot-peened material	Shot peening method and parameters	Tribological testing method and parameters	Wear rate of reference (mm ³ /N.m)	Min. wear rate (mm ³ /N.m)	Max. wear rate (mm ³ /N.m)	% Min. wear rate	% Max. wear rate
Present study	Cp-Ti	SP (Stainless steel shots)	Ball on disc (6 mm Al ₂ O ₃ ball, 15 N, 300-600 m)	550E-06 (300 m) 556E-06 (600 m)	454 E-06	556E-06	-17,45455	18,34532
1	Ti6Al4V (Direct metal laser sintering)	SP (Stainless steel shots) SP (Nutshells) SP (ceramic beads)	Ball on disc (ringer solution, 6 mm Al ₂ O ₃ ball, 10 N, 100 m)	7.02E-04	4.45E-04 5.35E-04 4.14E-04	5.79 E-04 6.69E-04 5.47E-04	-41,02564	-4,70085
2	[2] Alpha Ti with TiB (AM)	SP (S-550 steel shots, 100% coverage, 90 psi, 2 min)	Ball on disc (1N-17.5 N loads, 6 mm AISI52100 ball, 160 rpm, 300 m)	480E-06 (1N), 520E-06 (15N)	480E-06	850E-06	76,31579	3,26797
3	[3] AA7075 Alloy	SP (S230, 200%, 15s, 45psi)	Reciprocating (10 and 20 N load, 100, 200 and 1000 m, 0.5 m/s)	208E-06 (100 m) 249E-06 (1000m)	208E-06	690E-06	-4,79452	30,28169
4	[4] 7A52 Al alloy	Ultrasonic peening	Ball on plate (5 mm GCr15 ball, 90 m, 15m/min, 5N - 50N load)	0.105882 (5 N) 0.058824 (50 N)	0.082353	0,058824	-22,22222	-31
5	[5] AISI 5160	SP (White iron ball, 2min)	Reciprocating (320 N, 2 Hz, 10 min, AISI 52100 steel)	-	5 %	73 %	-5	-73
6	[6] AISI 5160	SP (White iron ball, 1 – 5 min)	Ball on disc (200 N, 0.5 m/s, 10 min, PAO ₄ immersed)	1.178571	1.625	4.321429	37,87884	266,66684
7	[7] 4Cr9Si2 Valve Steel	SP (0.2-0.6 MPa air pressure, 0.4-0.6 mm Cr-Mo alloy steel shots)	Pin on disc (DZ22 superalloy steel 6 mm pin, 200 N, 450 °C, 1800 s)	5.211	1.812	3.275	-65,2274	37,15218
8	[8] 17Cr2Ni 2MoVN b stee	SP (0.4, 0.5, and 0.6 MPa air pressure, zirconia shots (0.6 mm))	Ball on disc (3 mm AISI 52100 steel ball, 0.092 m/s and 300 N, lubricated cond.)	4.134	0.832	2.348	-79,87421	43,20271
9	[9] Al7075-T6511 alloy	SP (S230 steel balls (0.3 mm), 0.35 and 0.45 mmA SP intensities)	Pin on disc (GCr15 steel pin, 20 N, 60 min, sliding of 50 r min ⁻¹)	2.51	0.316	0.734	-87,41036	70,75697
10	[10] 17-4PH steel (AM)	SP (0.3 and 0.6 MPa air pressure, stainless steel, nutshell granules, ceramic beads)	Ball on disc (WC-Co (6 mm), 10 N, 0.1 m/s)	2.05E-04	1.32E-04	1.66E-04	-35,60976	-19,02439

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