Solid Particle Erosion Test at High Temperature (ASTM G 76)

The solid particle erosion (SPE) test system involves repeated impacts of the erodent particles driven by pressurized air striking the surface of the test sample. The amount of mass loss of the tested sample divided by the mass of erodent can present the wear rate, or the volume loss can be also evaluated to rank the erosion resistance of full range of materials: ceramics, metals, coatings, thin films and composites. The impingement angles can vary from 15° to 90° assisted by a flexible holder (Fig 1). The erodent particles (typically blocky Al_2O_3 particles) are usually used as shown in Fig 2 and fed using the air pressure and driven through a tube leading to the heating chamber connected to two heaters just before the nozzle exit The temperature of the sample surface is measured by a flexible thermocouple that can be further inserted into the sample as required.

Testing set-up parameters:

Feed rate of Al_2O_3 abrasive	up to 400 g/min.	Pressure:	up to 5 bar
Stand-off distance:	up to 150 mm.	Nozzle diameter:	7.5 mm
Standard sample dimension:	40x40x5-10 mm.	Temperature (surface):	up to 250° C
Incident impingement angle:	up to 90°		

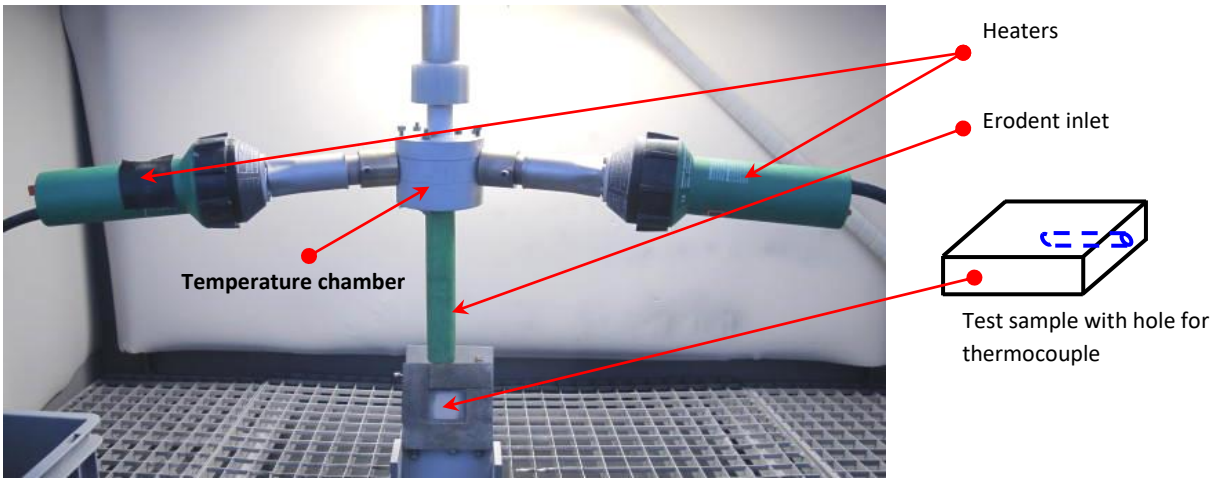

Figure 1: Single particle erosion set-up with two heaters

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Used Standard Method

ASTM G76: Standard Test Method for Conducting Erosion Tests by Solid Particle Impingement Using Gas Jets.

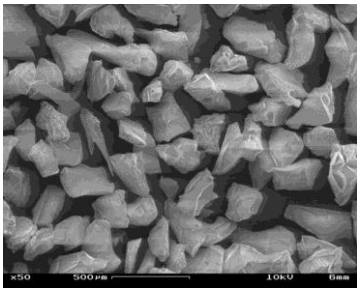
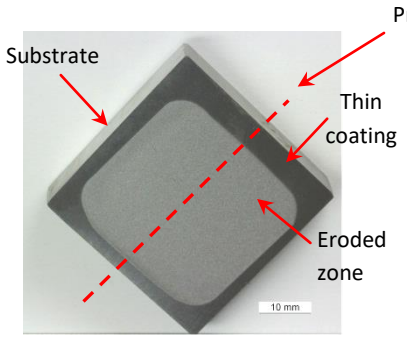


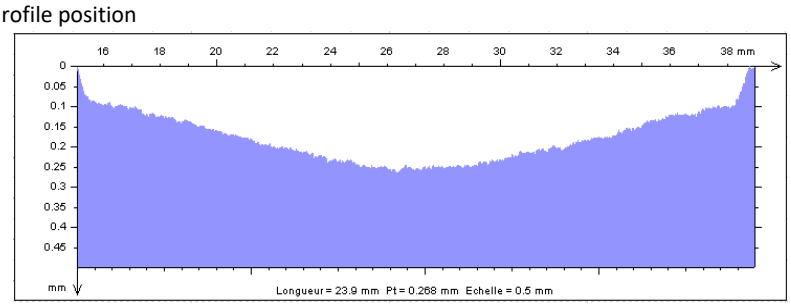
Figure 2: SEM micrograph showing the morphology of the blocky alumina erodent particles.

Example of solid particle erosion test [(1)]:

Solid particle erosion tests have been performed on thin coating (20 µm) and on thermally sprayed WC-Co-Cr coatings using different mask configurations and different impingement angles. The wear rate was evaluated using the gravimetric and the topographic methods.



a)



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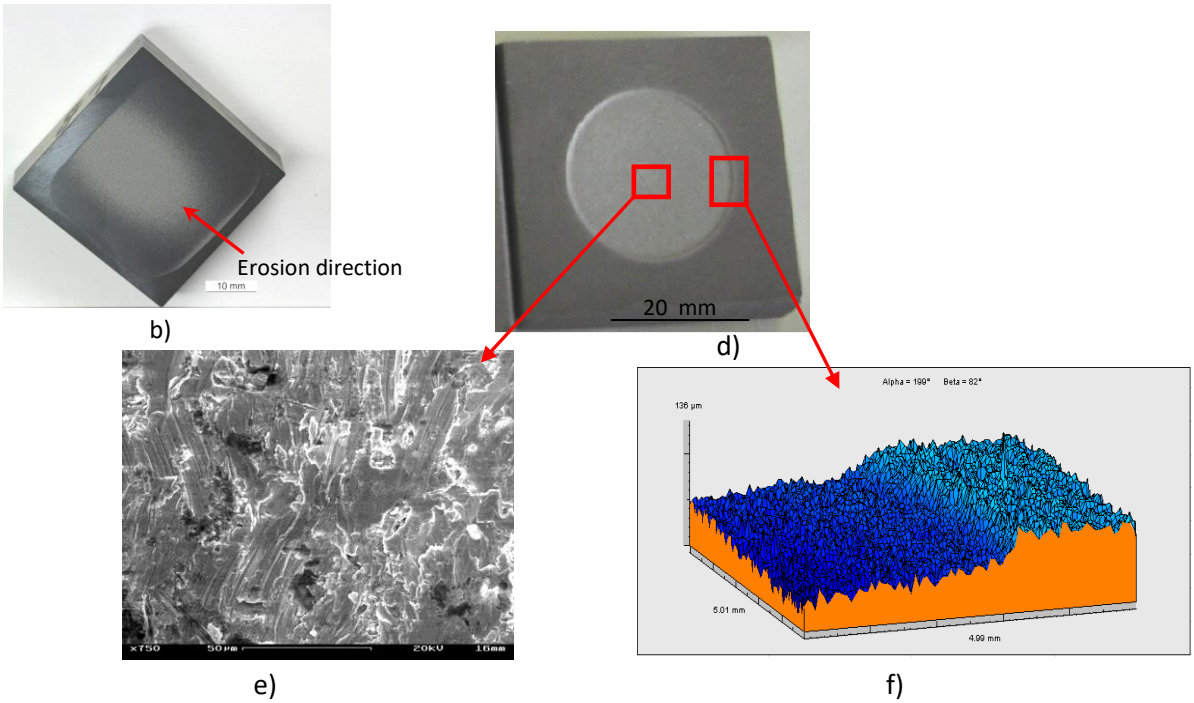

Figure 3: a & b) the worn surface of thin coating using a rectangular mask with an impingement angle of 90° and 30° respectively, c) topographic profile measured across the worn surface, d) worn surface of WC-Cr-Co thermally coating using circular mask, e) SEM micrograph of the worn coating surface, f) 3D topographic measurement of the eroded zone at the edges. [(1)] *Hadad_Wear 2007*

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