10 RIPT 2022
Les Rencontres Internationales de la Projection Thermique
JÜLICH
Forschungszentrum

10 RIPT 2022
Les Rencontres Internationales de la Projection Thermique
JÜLICH
Forschungszentrum

10 RIPT 2022
Les Rencontres Internationales de la Projection Thermique
JÜLICH
Forschungszentrum

JÜLICH
FORSCHUNGSZENTRUM
Atmospheric Plasma Spraying (APS)
High-Velocity Oxy Fuel Spraying (HVOF)
Laser Cladding and Structuring

Plasma Spray – Physical Vapor Deposition (PS-PVD)
JÜLICH
Process development
TBC microstructures
Gas separation membranes
Powder Characterization Lab
Lab 147

Plasma Spray – Physical Vapor Deposition (PS-PVD)

JÜLICH Forschungszentrum

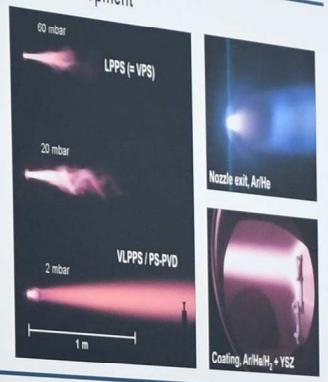
The manufacture of EB-PVD-like columnar structured, strain-tolerant thermal barrier coatings (TBCs) by plasma spraying was the major motivation to develop the plasma spray-physical vapor deposition (PS-PVD). Besides, also thin and gas tight layers can be obtained by PS-PVD even directly on highly porous substrates. Typical applications are gas separation membranes and electrolytes for solid oxide fuel cells.

Process development

Metallic alloys are deposited by plasma spraying under protective argon atmosphere and low pressure (< 10 kPa) (low pressure plasma spraying, LPPS, also termed vacuum plasma spraying, VPS).

Several years ago, the pressure was decreased (< 500 Pa) to obtain particular thin and dense coatings. This process is termed very low plasma spraying (VLPPS).

Increasing electrical currents up to 3 kA, so that an input power of 150 kW and more is achieved, it is even possible to evaporate ceramic feedstock. This process is termed plasma spray-physical vapor deposition (PS-PVD).



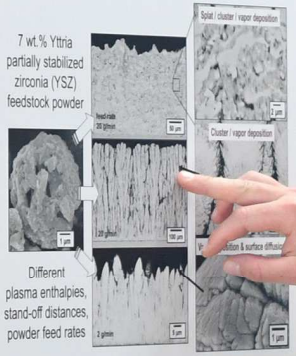
TBC microstructures

Computational fluid dynamic simulations for a typical PS-PVD process to deposit columnar YSZ revealed that 64% of the plasma net power was absorbed by the feedstock particles and 57% of the feedstock mass is transferred to vapor.

Evaporated feedstock atoms and molecules follow the plasma gas streamlines. In the boundary layer of the substrate, super-saturation is likely so that stable clusters can be formed.

As molecules and clusters are diverted parallel to the substrate surface, columns are generated by shadowing due to the interaction between surface roughness and angular directions of arriving particles.

7 wt.% Yttria partially stabilized zirconia (YSZ) feedstock powder

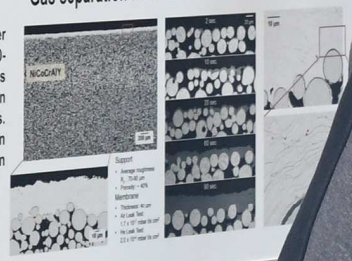


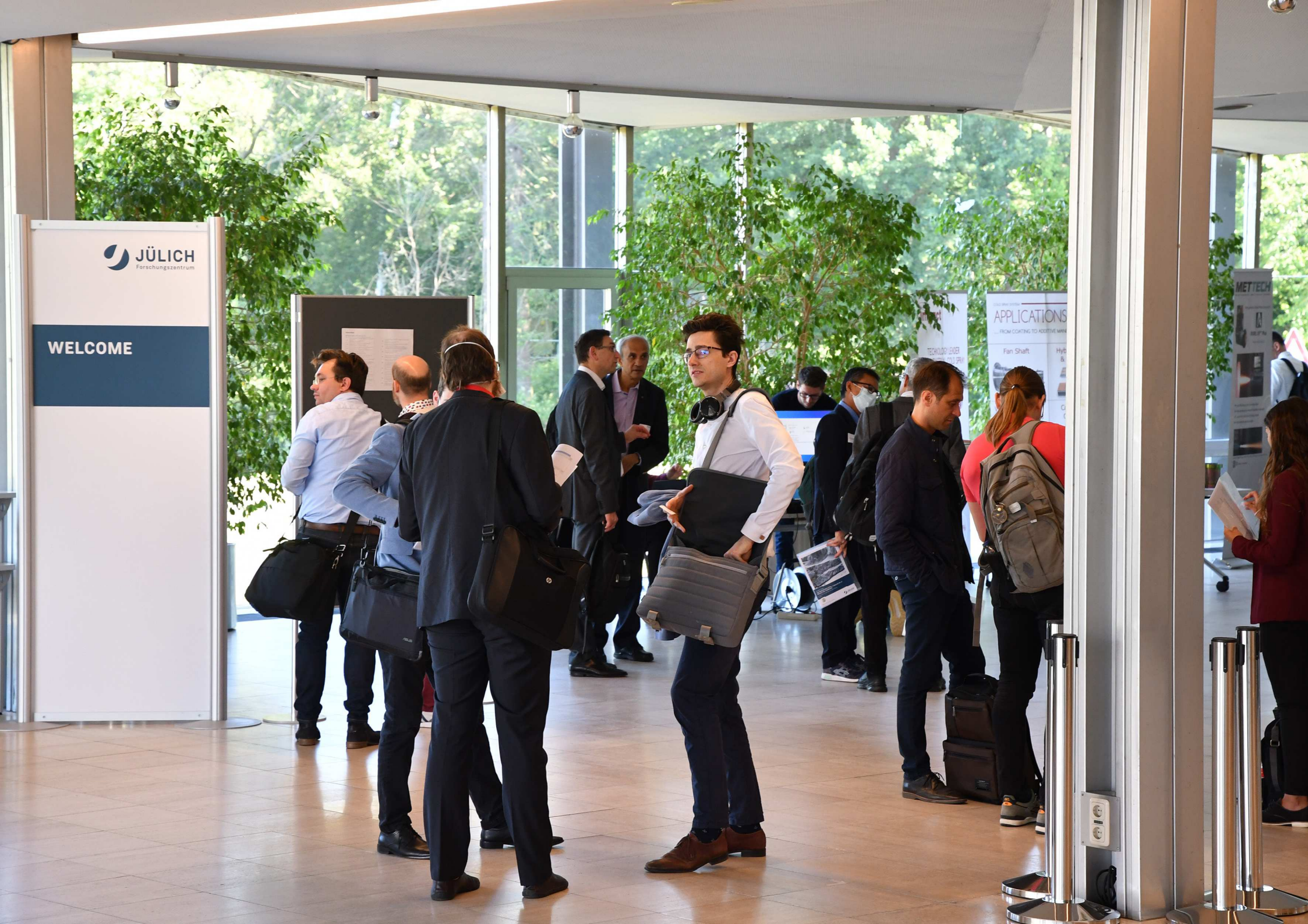
Different plasma enthalpies, stand-off distances, powder feed rates

Gas separation membranes

PS-PVD allows for lower deposition temperatures (800-1000°C) in much shorter times than conventionally applied in other ceramic processing routes. After impact, the splats remain highly flowable and form thin and dense lamellae.

Example:
Mixed ion and electron conductor
$La_{0.58}Sr_{0.4}Co_{0.2}Fe_{0.8}O_3$ (LSCF)




JÜLICH
Forschungszentrum
WELCOME
APPLICATIONS
Fan Shaft
METTECH

JÜLICH

JÜLICH

Les Rencontres Internationales de la Protection
Technique (10 RIPT)
Voting ballot for poster session
Please select only one poster in this session

JÜLICH
Forschungszentrum

Welcome to
10 Les Rencontres
Internationales
de la Projection
Thermique (10 RIPT)
Lech Pawlowski, Robert Vaßen
June 1 – 3, 2022
Forschungszentrum Jülich, Germany
JÜLICH
Forschungszentrum

Welcome to
10 Les Rencontres Internationales de la Projection Thermique (10 RIPT)
Lech Pawlowski, Robert Vaßen
June 1 – 3, 2022
Forschungszentrum Jülich, Germany
Mitglied der Helmholtz-Gemeinschaft

EXIT

10 RIPT 2022
Les Rencontres Internationales de la Projection Thermique
JÜLICH
Forschungszentrum

FIC COMMITTEE
Michael – IKTS, Dresden, Germany
– Swinborne University, Hawthorn, Australia
ni – University of Modena, Italy
v – Ceitec, Brno, Czech Republic
– Xi'an Jiaotong University, China
niversity of Cambridge, United Kingdom
CPT, Barcelona, Spain
re – University of Limoges, France
k – Helmut-Schmidt-Universität, Germany
ent – MINES ParisTech, France
nt – University West, Trollhättan, Sweden
reas – University of Stuttgart, Germany
– Chalmers University, Sweden
– NIMS, Tsukuba, Japan
nas – TU Chemnitz, Germany
bo Inst. Mat. Sci. Engn. China
University UNIMEP, Sao Paulo, Brazil
ca – University of Modena, Italy
– IPP, Prague, Czech Republic
nina – CDTA, Alger, Algeria
niversity West, Trollhättan, Sweden
jay – Stony Brook, New York, USA
420 x 297 mm
WEDNESDAY, JUNE 1ST, 2022
ROOM 338
EDUCATIONAL COURSE
Thermal spray technology: Position among Films
Characterization and Application, and Technology
09:00 Welcome and introduction
Lech Pawłowski and Georg Mauer
09:15 Physical Methods of Film and Coatings Deposition
Lech Pawłowski
10:15 Microstructure Control of Sprayed Coatings: Particularities, Usefulne
From Splat to Coatings
Thomas Grund, Chang-Jiu Li
11:15 Coffee break
11:30 Evolution of Thermal Spray Technology and its Applications
Shrikant Joshi
12:30 Lunch break (Seecasino)
13:45 Thermal Spray Process Diagnostics and Deposit Formation Dynamics
Sanjay Sampath
14:45 Experimental demonstration of films and coatings technologies as we
Georg Mauer and colleagues
16:00 ETSA GENERAL ASSEMBLY
5th General Assembly of the Europea
19:00 WELCOME RECEPTION: FO
N

Chemnitz University of Technology - Materials and Surface Engineering Group
Xi'an Jiaotong University—— School of Mater. Sci.& Eng.
Microstructure of Sprayed Coatings:
rticularities, Usefulness, and Methods of Characterization
-
From splat to coatings

Chemnitz University of Technology - Materials and Surface Engineering Group
Xi'an Jiaotong University—— School of Mater. Sci.& Eng.
Thank you for your attention!

Geb. 04.7
E1

(SPS)
Plasma Spraying
JÜLICH

JÜLICH
High-Velocity
Air Fuel
Spraying (HVAF)
JÜLICH
Cold
Gas
Spraying (CGS)
JÜLICH