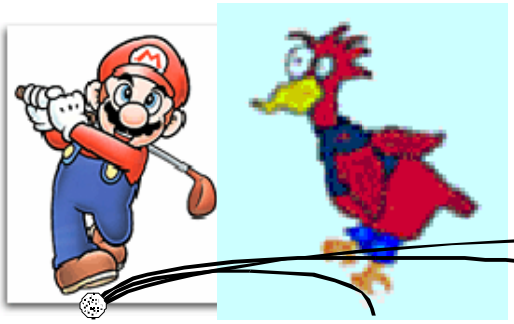
The European Commission

Advanced Long Life Blade Turbine Coating Systems

ALLBATROS



3 under par !

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CONTRACT N° : ENK5-CT2000-00081

PROJECT COORDINATOR :

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CONTRACTORS :

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INPT	F
CNRS	F
Cranfield University	UK
Linköping University	S

ration : 48 months -01/01/01-31/12/04

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ALLBATROS-WP1

Choice of reference coating systems

Task 1.1. Choice of coating substrate systems

Task 1.5. Screening tests (hardness)

Task 1.6. Selection of 2 ref. coating/substrate sys

Task 1.8. Choice of fuel

Task 1.8.2. Selection of some fuels

Task 1.8.4. Selection of one fuel

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ALLBATROS-WP2

Innovative coating development

ask 2.1. Bibliographic analysis

ask 2.2. Definition of innovative coating syst.

ask 2.4. Development of innovative coatings

ask 2.5. Microstructural investigations

ask 2.6. Screening tests (hardness)

ask 2.7. Selection of 2 innovative coating by substi

ask 2.8. Specification of the coatings

ask 2.9. Knowledge transfer from ONERA to HROMALLOY FRANCE

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Characterisation of reference and innovative coatings

Task 3.1. Definition and standardization of tests

Task 3.6. Microstructural investigations from tasks 3.2and 3.3

Task 3.7. Selection of 2 coatings systems

Task 3.9. Physical properties investigations

Task 3.9.1. CTE, Thermal diffusivity,

Task 3.10. Selection of 1coating/substrate for engine tests of WP5

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Model developments

Task 4.1. Identification of failure mechanisms

Task 4.2.3.Oxidation model development

Task 4.3.3. Corrosion model development

Task 4.6. Reflection to merge the 3 models in 1

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ALLBATROS-WP5

Engine tests

Task 5.4. Valuation of tests

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Superalloys and coatings

3 Superalloys : CMSX-4, SC² and INCO792

4 Reference coatings :

RT22, Nickel aluminide platinum modified (diffus
oating)

Codep : nickel aluminide realised by pack
ementation (diffusion coating)

Overlays NiCoCrAlY AMDRY 995 and AMDR
97 vacuum plasma spray (overlay coating)

4 Innovative coatings : MCrAlY -base

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MODEL TEST MATRICES

Oxidation

Corrosion

TMF

LCF

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Oxidation test matrix

Long term exposure : cycles of 300 hours

	CMSX4			SC2			IN792			
22	MCrAlY	X	RT22	MCrAlY	X	RT22	MCrAlY	X	Total	
4	4		4	4		4	4		24	Long term exposures at 900
4	4		4	4		4	4		24	Long term exposures at 105
2		2	2		2		2	2	12	T+DT tests :1050+25 °C
2	1	2	2	1	2	1	2	2	15	T+DT tests :1050+50 °C
2		2	2		2		2	2	12	T+DT tests :950+100 °C
2	1	2	2	1	2	1	2	2	15	T+DT tests :900+50 °C
6	3	3	6	3	3	3	6	3	36	TGA + furnace tests
6	4	4	6	4	4	4	6	4	42	Variable coating thickness
8	2	2	8	2	2	2	8	2	36	Cyclic oxidation
2		2	2		2		2	2	12	TGA tests (complement of W
38	19	19	38	19	19	19	38	19		
	76	+		76	+		76	=	**228**	

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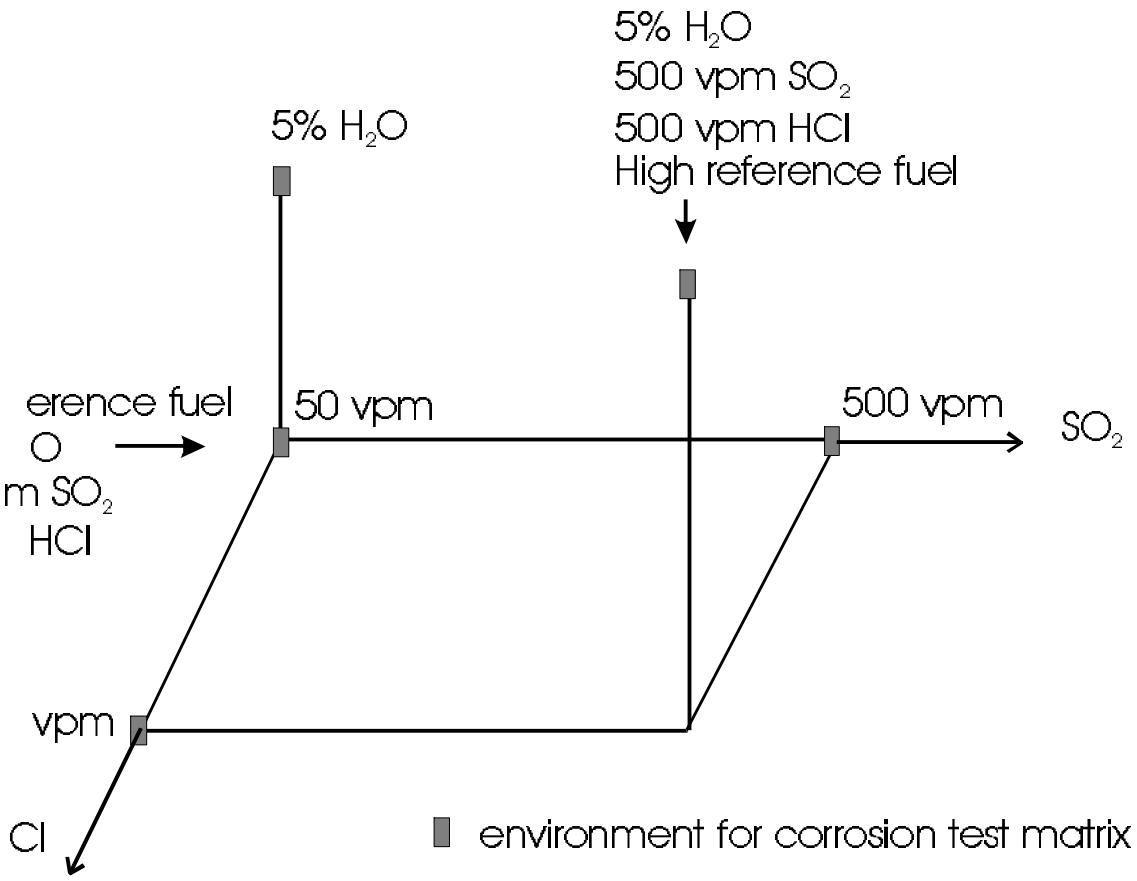
Corrosion test matrix



First tests :

2 temperature

600< T<950°C

and 5 environ

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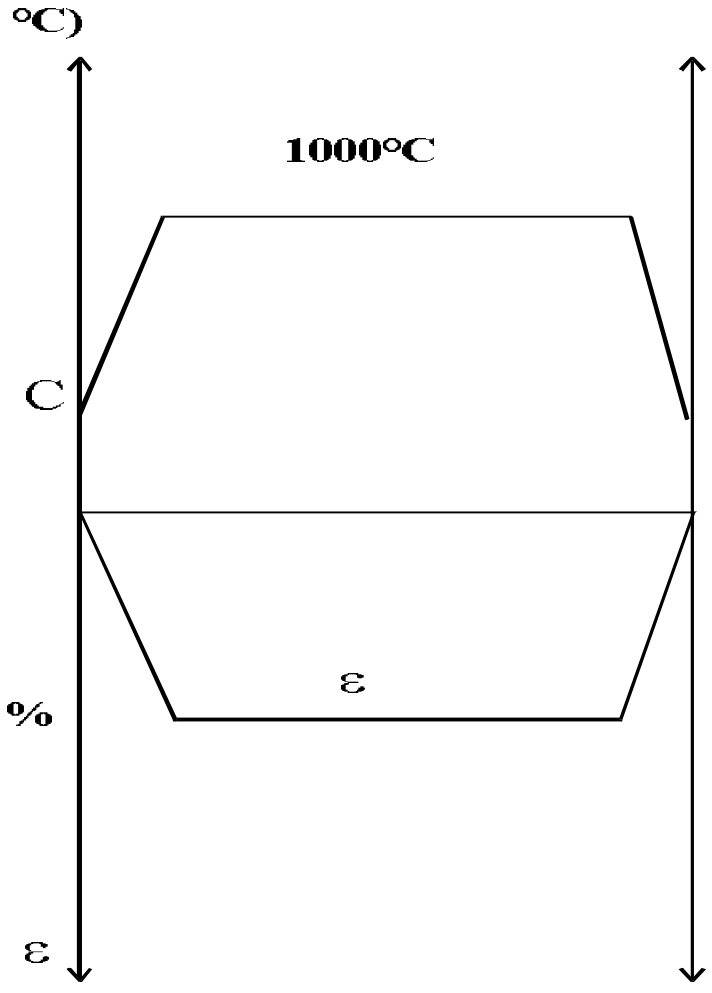
TMF tests matrix



- 3 substrates and 3 coatings (2 reference coatings and 1 innovative coating).
- 3 ? levels between 0 and (-0.5%)
- Holding time : 5 minutes
- Strain rate : 10^{-5} s^{-1}

LCF tests matrix

3 substrates and 3 coatings (2 ref. and 1 innovative
2 temperatures : 700 and 900°C

Alloy	Temperature	RT 22	AMDRY 997	Innovative coatings	Number of specimen **by alloy**
CMSX-4	700	5 + 3 (aged)	5 + 3 (aged)	5 + 3 (aged)	24
	900	5 + 3 (aged)	5 + 3 (aged)	5 + 3 (aged)	24
INCO792	700	5 + 3 (aged)	5 + 3 (aged)	5 + 3 (aged)	24
	900	5 + 3 (aged)	5 + 3 (aged)	5 + 3 (aged)	24
SC² (SCB)	700	5 + 3 (aged)	5 + 3 (aged)	5 + 3 (aged)	24
	900	5 + 3 (aged)	5 + 3 (aged)	5 + 3 (aged)	24

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Innovative coatings

P. Josso, M.-P. Bacos, M. Douin & S. Mercier
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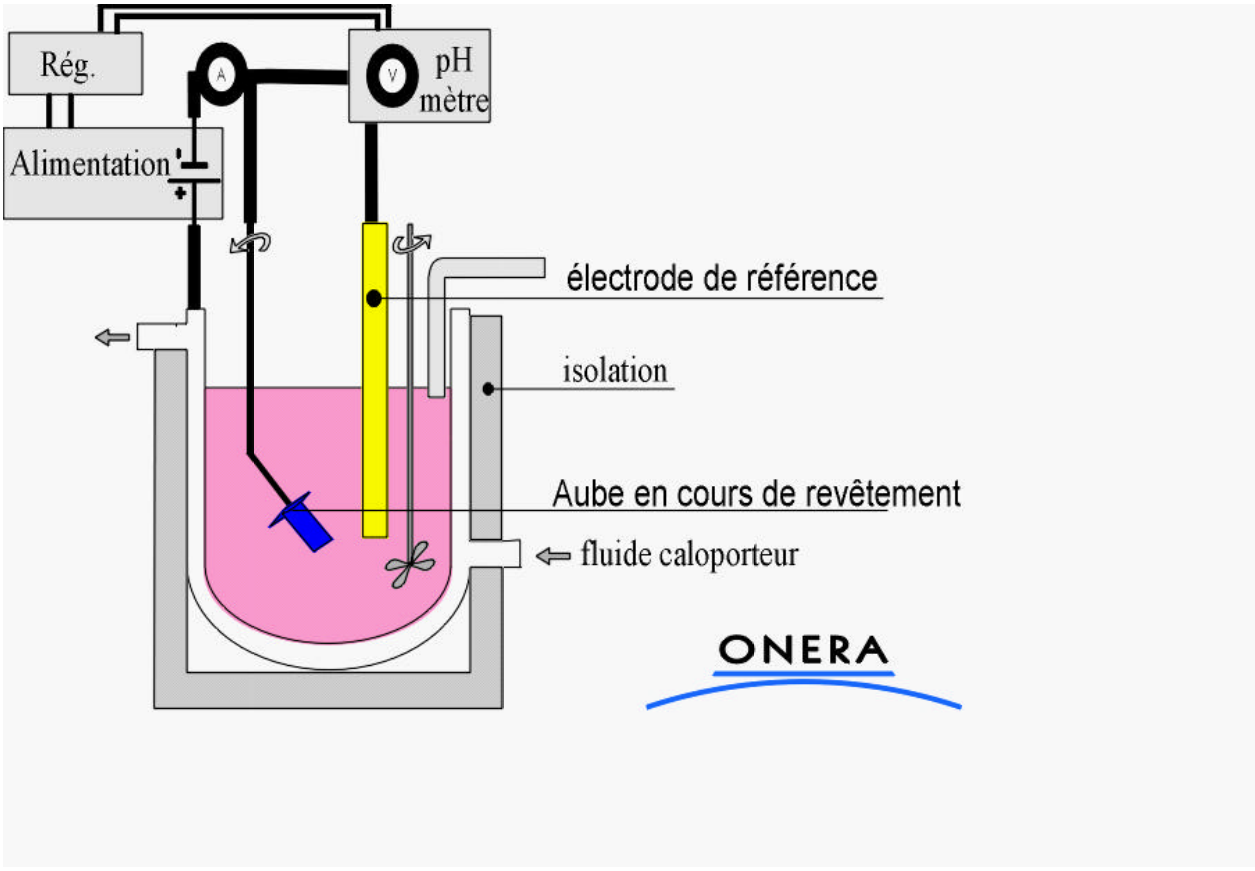
)NERA’s technique for MCrAlY deposition



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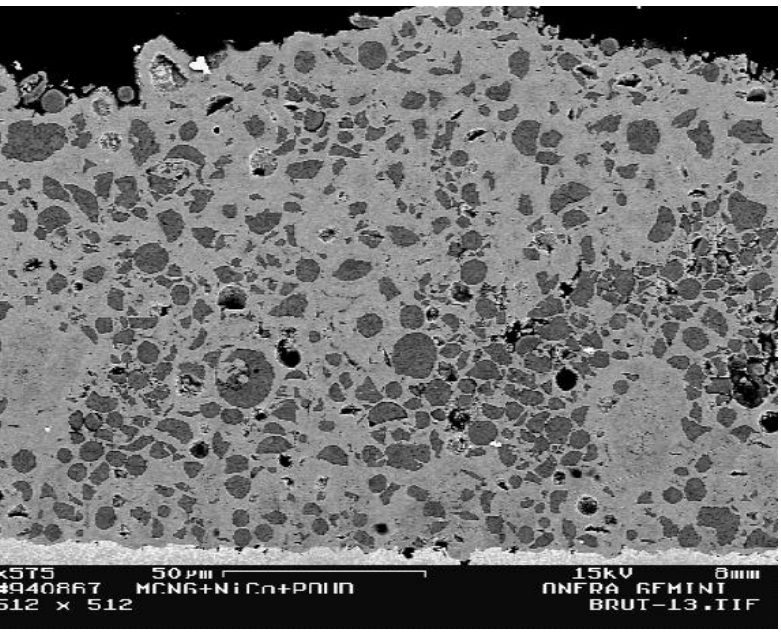
Ni + [CoCrAlYTA]
before aluminisation or heat treatment



MCrAlY/Superalloy interface

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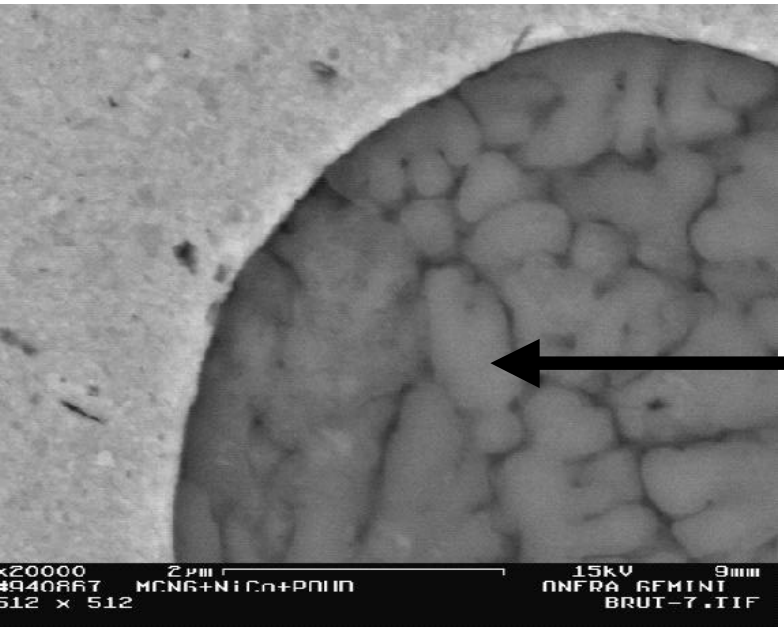
Ni + [CoCrAlYTA]
before aluminisation or heat treatment



Interface between a particle and the matri

CoCrAlYTa powder

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Work in progress

- Matrix Ni : % of embedded particles limited to abo
  50% it means in agreement with MCrAlY composition (except Al)
- n order to introduce reinforcement particles
  - development of NiCo matrix
  - development of MCrAlY coatings reinforced wit refractory elements in order to increase oxidation/corrosion resistance and mechanical properties (particles dispersion)

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