

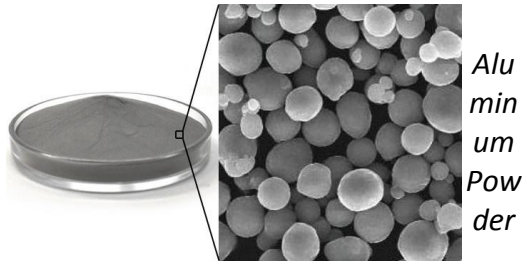
STUDY OF AL-BASED POWDER CHARACTERISTICS TAILORED FOR COLD SPRAY

Hugo DURAND

(2018 – 2021)

Industrial Partner: TOYAL

Supervisors: Michel JEANDIN (MINES), Francesco DELLORO (MINES), Fabrice MORVAN (TOYAL)



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- Cold Spray
- Powder
- Aluminium
- Laser Shock
- Nano-compression
- Simulation

Abstract:

Cold gas dynamic spray, namely cold spray, is one of the most innovative thermal spray processes. The number of industrial applications for cold spray has been growing dramatically over the past 10 years. However, relevant advances can (must) be still expected from the tailoring of spray powders to the process through the dynamic mechanisms which are involved for deposition and densification. Up to now, powders for cold spray are conventionally selected among commercial powders which were formerly designed for conventional thermal spray, e.g. plasma spray and HVOF. These powders should be improved due to the mere fact that in higher temperature processes such as plasma spray, the particles can homogenize due to (at least partial) melting. In contrast, in cold spray, the particles remain at the solid state, which results in other requirements/specifications for suitable deposition and densification processes.

The scientific objective of the thesis is to determine the main powder characteristics (primarily when applied to Al-based materials) to promote particle-to-particle and particle-substrate adhesion phenomena and to improve coating build-up mechanisms. These characteristics are morphological, metallurgical, mechanical and physicochemical.

The study will show the various following stages:

- Morphological analysis (for elementary particles and using statistics when applied to the powder batch) for one-material powder and for blends.

- In-flight particle velocity measurements
- Numerical simulation of particle impact and modeling of coating build-up
- Laser shock experimental simulation of cold spray
- Micro-structural study of particles and testing for the assessment of related particle mechanical properties
- Adhesion studies at particle-particle and particle-substrate interfaces.

DUCTILE FRACTURE OF MY HYPERALLOY

Jean TOTO

(2015 – 2018)

Industrial Partner: Science Corp

Supervisors: E. Einstein, M. Nobody



- Ductile fracture is important
- Model accounting for anisotropy, kinematic hardening and dual phase microstructure
- Application to a new plane

Abstract:

Ibi victu recreati et quiete, postquam abierat timor, vicos opulentos adorti equestrium adventu cohortium, quae casu propinquabant, nec resistere planitie porrecta conati digressi sunt retroque concedentes omne iuventutis robur relictum in sedibus acciverunt.

Unde Rufinus ea tempestate praefectus praetorio ad discrimen trusus est ultimum. ire enim ipse compellebatur ad militem, quem exagitabat inopia simul et feritas, et alioqui coalito more in ordinarias dignitates asperum semper et saevum, ut satisfaceret atque monstraret, quam ob causam annonae convectio sit impedita.

Hanc regionem praestitutis celebritati diebus invadere parans dux ante edictus per solitudines Aboraeque amnis herbidas ripas, suorum indicio proditus, qui admissi flagitii metu exagitati ad praesidia descivere Romana. absque ullo egressus effectu deinde tabescebat immobilis.

Sed (saepe enim redeo ad Scipionem, cuius omnis sermo erat de amicitia) querebatur, quod omnibus in rebus homines diligentiores essent; capras et oves quot quisque haberet, dicere posse, amicos quot haberet, non posse dicere et in illis quidem parandis adhibere curam, in amicis eligendis negligentis esse nec habere quasi signa quaedam et notas, quibus eos qui ad amicitias essent idonei, iudicarent. Sunt igitur firmi et stabiles et constantes eligendi; cuius generis est magna penuria. Et iudicare difficile est sane nisi expertum; experiendum autem est in ipsa amicitia. Ita praecurrit amicitia iudicium tollitque experiendi potestatem.