

# Development of novel polymer-nanocomposite coatings produced by HT-HVOF spraying



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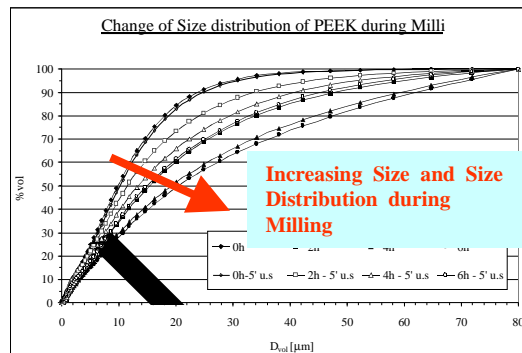
## Introduction

High Thrust High velocity oxygen fuel spraying (HT-HVOF) is an ideal method for coating of different supports with a high temperature resistant polymer layer. With nanocomposites, layers with novel properties or combination of properties are possible. In this project, different coatings for a very broad application range will be developed, using as starting material polymer based nanocomposite powders which will be HT-HVOF-sprayed, a new coating process developed by the industrial partner DACS.

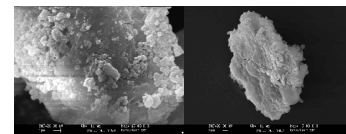
## Powder preparation

PEEK and PPS powders were mixed with nanosized alumina powder using different kind of mills. Best results were achieved with a high-energy ball mill after 2h milling. The grain size of the polymers increased during the milling by a factor of two. In all cases, a homogeneous mixture of polymer and alumina particles could be achieved.

The thermo-physical characterization of the mixed alumina/polymer powder showed an interesting change in the glass-temperature of the polymer.



REZ	T <sub>g</sub>	OS <sub>g</sub>
PPS	8	2
PPS0%	2	1



SEM of PPS + 10% Al<sub>2</sub>O<sub>3</sub>  
2h attritor at 250 rpm

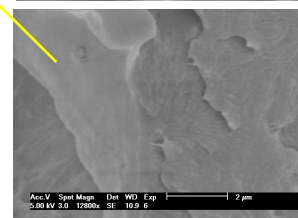
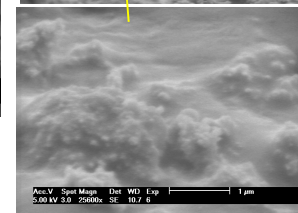
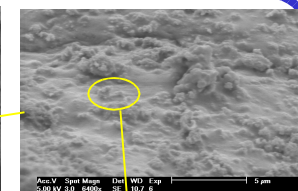
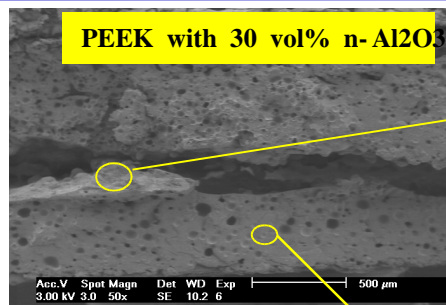
## Results

Large spraying distance,

Surface

Short spraying distance

An existing HVOF equipment needed some important changes to run in the new high thrust mode. Especially a powder feeder had to be developed to achieve a homogeneous feed rate against high process pressure. A first prototype of such a high pressure powder feeder for continuous transport of fine powders with very bad flowing behaviour is now successfully realized. First spraying test with modified equipment for HVOF were carried out.



## Acknowledgement

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## Outlook

Further spray experiments with high energy milled powders are foreseen. The Flowability of the powders has to be improved. Characterisation of the layer regarding corrosion resistance, abrasion resistance and mechanical properties are planned.