Project no. : STRP 505541-1

MONCERAT

Broadening the field of ceramic components by joint and interactive research on EDM machining technology, noval ceramic materials based on nano-powders made by SHS and design methodology

Specific Targeted Research Project

Priority 3: Nanotechnologies and nano-sciences, knowledge-based multifunctional materials and new production processes and devices

Publishable Executive Summary
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Period covered: from 01/01/2006 to 30/06/2007 Date of preparation: 30/09/2007

Start date of project:01/01/2004 Duration: 3,5 years

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Final

Publishable Executive Summary

Project objectives

Ceramics have an established market in industrial applications like metal forming, machining and some mechanical components. Most ceramics are prepared by conventional powder metallurgy (PM) and about 60 % of all components need some kind of post sintering machining operation.
Electro Discharge Machining (EDM) is a process that could machine these hard materials, providing that the ceramics have a sufficiently high electrical conductivity. The major advantages of EDM are the **accurate machining** and the ability to produce **complex shapes.** Although some ceramic materials can be machined by EDM (e.g. TiN, TiC,..), the EDM process and ceramic materials have never been co-developed for each other.

The **MONCERAT project** aimed the research in the development of **new electro-conductive ceramic materials** as well as the development of **new EDM generators**. An important aim of the MONCERAT project was to gain a basic understanding on the interaction between the ceramic material (e.g. microstructure) and the EDM machining process. Further, the project aimed to study how material properties of EDM'd ceramic components can be integrated into the **design phase**. The production of new ceramic materials will be partially based on the use of high quality nano-powders produced by the **SHS process** (Self propagating High Temperature Synthesis).
The MONCERAT project expects a large potential **impact** on the use and development of ceramic materials for automotive, aerospace, machine tool, process engineering, health care, biomedical, wear, micro-mechanics and environmental applications.

Error! Reference source not found. lists all the details of the MONCERAT project.

Project acronym	MONCERAT
Project title	Broadening the field of ceramic components by joint and interactive research on EDM machining technology, noval ceramic materials based on nano-powders made by SHS and design methodology
Project logo	Moncerat
Project No.	STRP 505541-1
Project website	http://www.moncerat.org

Table 1 Project details

Achievements

The objectives have been reached by a strong European consortium (see Table 2) consisting of innovative enterprises active in development of ceramic materials and EDM machining technology (La Céramique-Plastique (FR), Bodycote HIP (BE), ESK Ceramics (DE), Charmilles Technologies (CH)), innovative and leading research institutes (Katholieke Universteit Leuven (BE), INSA (FR), RWTH Aachen(DE)) and a group of end-users, including SME's, having a huge interest in using ceramic components within their applications (SMS Research & Development (NL), LN Industries (CH), MicroLaserTec (DE) and Maxon Motor (DE)). New insights in understanding the relation between the material microstructure and the EDM behaviour

have been elucidated. One of the unique aspects of this project is the collaboration of different European key-players covering all steps in the ceramic component design and manufacturing (basic ceramic material production, optimal design, manufacturing and end-user applications).
The end-users are currently using these ceramic materials within their products. First evaluations of the case study parts show a much better performance.

The project achieved a major breakthrough in the machining of ceramics. This resulted in the development of new ceramic composite materials, including nanocomposites (e.g. ZrO_2-WC,…), and related EDM technology to machine this materials with excellent quality. The project also learned that a simple substitution of a classical component (e.g. steel) by a ceramic one will not directly be successful and an adapted design is essential to reach the best profit. Making the latter statement clear to various industries is an important dissemination issue within the MONCERAT project. An important shift from classical materials to ceramic based components is to be expected, with much better functional properties like high wear and corrosion resistance, good high temperature performance and a large strength to density ratio.

The consortium

	Organisation, Country	Website
KATHOLIEKE UNIVERSITEIT LEUVEN	K.U.Leuven, Dept. PMA & MTM, Belgium	www.kuleuven.be
CHARMILLES	Charmilles Technologies S.A., Switzerland	www.charmilles.com
La Céramique-Plastique	Propension, France	not available
Bodycote	Bodycote HIP, Belgium & DDT, France	www.bodycote.com
ESK	ESK Ceramics GmbH & Co. KG, Germany	www.esk.com
INSA LYON	INSA de Lyon, France	www.insa-lyon.fr
RWTH AACHEN UNIVERSITY	IWM Aachen, Germany	www.iwm.rwth-aachen.de
LNI LN INDUSTRIES SA	LN Industries, Switzerland	http://www.lni.ch
SMS RESEARCH & DEVELOPMENT	SMS Research & Development, Holland	www.sms-tb.nl
MICROLASERTEC	MicroLaserTec, Germany	www.microlasertec.de
maxon PRECISION MOTORS	Maxon motor, Germany	www.maxonmotor.com

Table 2: Partner list of MONCERAT project