

Incorporation of foundry sand in cementeous materials

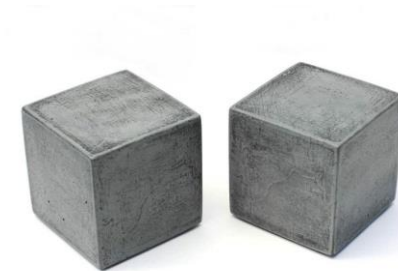
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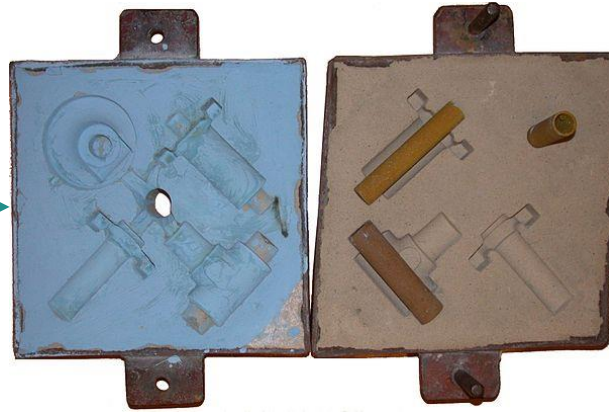
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1. Introduction



Foundry industry



Sand casting



Foundry sand

100 million tons
annually generated
worldwide

2. Background and aim

Several studies analyzing the feasibility of the foundry sand (FS) as a replacement of the fine aggregate in cementous materials.

Types of FS



Green sand



Chemically bonded sand



Cement treated bases

Cementous materials



Concrete



Mortars

Gaps



Can FS being use for structural concrete?
 Can FS being use for CTB?
 Can FS being use for mortars?
 Which other types of cementous materials can be manufactured?

3. Evaluation guide

Basic skills

- CB11 Systematic understanding of a field of study and command of the skills and research methods related to the field.
- CB12 Skill to conceive, design or create, implement and adopt a substantial process of research or creation
- CB13 Skill to contribute to the enlargement of the knowledge limits through an original research
- CB14 Skill to carry out a critical analysis and assessment and synthesis of new and complex ideas
- CB15 Skill to communicate with the academic and scientific community and with society in general about the scope of knowledge in the ways and languages of common use in the international scientific community
- CB16 Skill to encourage, in academic and professional contexts, the scientific, technological, social, artistic or cultural progress in a society based on knowledge.

Capacities and personal abilities

- CA01 Cope in contexts in which there is little specific information
- CA02 Find the key questions to be answered to solve a complex problem.
- CA03 Design, create, develop and undertake new and innovative projects in the knowledge scope.
- CA04 Work both in teams and individually in an international or multidisciplinary context.
- CA05 Integrate knowledges, face complexity and formulate judgements with limited information.
- CA06 Intellectual criticism and defence of solutions.

4. Development of the research

Literature review



ScienceDirect

Aggregates
valorization



WEB OF SCIENCE

CA01

CA05

CB11

CB12

CB14

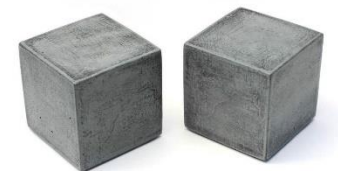
Mortar



Cement treated bases



Concrete



5. Results obtained from the research

Literature review

- The FS has been analyzed in the manufacturing of cemen treated bases, concrete, self-compacting concrete, mortars and masonry elements.
- Depending on the type of FS and molding process, the physical, mechanical and durability properties of cementous materials can vary.

Aggregates valorization

- The FS can be used as a natural sand replacement due it's not hazard material.
- FS sieve grading and physical properties are adequate to manufacture cementous materials.
- XRF analysis showed that FS is mainly constituent by SiO_2 (83.9 %).

Mortars

- Fout mortar mix degins using FS at different replacements (25%, 50% and 100%) were calculated and manufactured.
- A total of 135 specimens were manufactured.
- The flexural and compressive strength was studied.

CA02

CA03

CB13

CB16

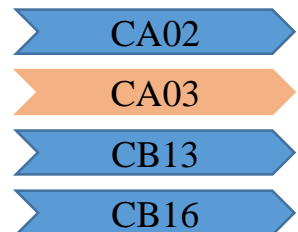
5. Results obtained from the research

Cement treated bases

- Three CTB mix designs using FS and Steel slags and different cement percents were calculated and manufactured.
- The effect of the compressive strength and cement content was studied.

Concrete

- Two concrete mix designs using FS and Steel slags were calculated and manufactured.
- Mechanical tests such as compressive strength, flexural strength and modulus of elasticity was studied.
- The durability of the concrete was analyzed.



6. Future lines of research

The future lines of research resulting from this doctoral thesis will be the use of foundry sand in self-compacting mortars and self-compacting concrete, analyzing its physical, mechanical and durability properties, proving that its use in structural and non-structural elements may be adequate.

CB11

CB12

CB13

CB14

CB15

CA01

CA02

CA03

CA04

7. SWOT

Internal factors	Strengths	Weaknessess
	Adequate facilities	Work peaks
	Highly efficient researchers and workers	Bottleneck in the use of the equipment
	Great team work and support	A lot of information to process
External factors	Opportunities	Threats
	Experience and knowledge due the many projects	Delays in the review of the publications
	Networking	Delays in the delivery of the materials
	Future trends in research	-

CB14

CA06

8. Scientific activities – Courses, movility and publications

Organizer: UC Doctoral School

El marco general del Doctorado. El método en la ciencia. 1ª Edición – 7 h

Cómo hacer una revisión sistemática de literatura – 3 h

La ética en la investigación científica – 3 h

Creación de líneas de investigación multidisciplinar y presentación de resultados.- 2 h

Técnicas de redacción y expresión del discurso científico en español – 20 h

La comunicación científica en Internet I: redes sociales, vídeos y curación de contenido – 20 h

Análisis cualitativo de datos – 20 h

El futuro profesional de los doctorandos. 1ª Edición – 3 h

¿Cómo puede mi investigación contribuir a la ciencia forense? Teoría y práctica del peritaje judicial como salida profesional y transferencia del conocimiento. – 8 h

La colaboración Universidad-Empresa. – 3 h

Generación y asociación de ideas y conceptos para la búsqueda de soluciones – 6 h

¿Qué es la ciencia? El falsacionismo de Popper – 8 h

¿Qué es la ciencia? El empirismo lógico de Carnap – 8 h

Curso de Iniciación a los proyectos europeos – 3 h

La relevancia de las competencias personales y profesionales en el contexto actual – 3 h

TOTAL: 117 h.

8. Scientific activities – Courses, movility and publications

Organizer: World Intellectual Property Organization (WIPO)

Seminario web itinerante sobre los servicios e iniciativas de la OMPI– 2 h

Organizer: Grupo 9 Universidades (G9)

Peer Review How to do it and survive it to get your paper published – 1 h

Performing well in an academic interview – 1 h

Planning for an academic conference – 1 h

Grant Proposal Writing – 1 h

What to do when research goes wrong – 1 h

Identifying the key 'sell' in your research – 1 h



CB12

CA01

CA02

CA03

8. Scientific activities – Courses, movility and papers



UAT

Movility

Five months of duration in an international stay in the Autonomous University of Tamaulipas. From april to september.

The dissemination of the research line of the foundry sand and steel slags and their use in cementous materials among undergraduate students, master students and the national academy of environmental sciences it is being done through webinars. Also, the writing of a book chapter and review article on foundry sands is being carried out.

CB15

CA04

Papers

Del Angel, G.G.; Aghajanian, A.; Tamayo, P.; Rico, J.; Thomas, C. Siderurgical Aggregate Cement-Treated Bases and Concrete Using Foundry Sand. Appl. Sci. 2021, 11, 435. <https://doi.org/10.3390/app11010435>

CB15

Book chapter

Del Angel, G.G.; Thomas, C., (2021). The use of foundry sand for recycled aggregate *The Structural Integrity of Recycled Aggregate Concrete Produced with Fillers and Pozzolans*.

CA03

Thank you for your attention