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NSAI Standards

Irish Standard Recommendation
S.R. CWA 17726:2021

High temperature accelerated ageing of advanced ceramic specimens for solar receivers and other applications under concentrated solar radiation

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S.R. CWA 17726:2021

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National Foreword

S.R. CWA 17726:2021 is the adopted Irish version of the European Document CWA 17726:2021, High temperature accelerated ageing of advanced ceramic specimens for solar receivers and other applications under concentrated solar radiation

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CEN WORKSHOP AGREEMENT

CWA 17726

June 2021

ICS 27.160; 81.060.30

English version

High temperature accelerated ageing of advanced ceramic specimens for solar receivers and other applications under concentrated solar radiation

This CEN Workshop Agreement has been drafted and approved by a Workshop of representatives of interested parties, the constitution of which is indicated in the foreword of this Workshop Agreement.

The formal process followed by the Workshop in the development of this Workshop Agreement has been endorsed by the National Members of CEN but neither the National Members of CEN nor the CEN-CENELEC Management Centre can be held accountable for the technical content of this CEN Workshop Agreement or possible conflicts with standards or legislation.

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Contents Page

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European foreword

This CEN Workshop Agreement (CWA 17726:2021) has been developed in accordance with the CEN-CENELEC Guide 29 "CEN/CENELEC Workshop Agreements – A rapid prototyping to standardization" and with the relevant provisions of CEN/CENELEC Internal Regulations – Part 2. It was approved by a Workshop of representatives of interested parties on 2020-12-15, the constitution of which was supported by CEN following the public call for participation made on 2020-01-31. However, this CEN Workshop Agreement does not necessarily include all relevant stakeholders.

The final text of this CEN Workshop Agreement was provided to CEN for publication on 2021-05-24.

Results incorporated in this CWA received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 721045.

The following organizations and individuals developed and approved this CEN Workshop Agreement:

- Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT) – Plataforma Solar de Almería (PSA), Jesús Fernández-Reche – Chairperson
- Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT) – Plataforma Solar de Almería (PSA), Inmaculada Cañadas – Chairperson
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Introduction

Concentrated solar power (CSP) is an important building block in installing a secure, competitive and sustainable energy system.

Advanced materials solutions for NEXT generation high efficiency concentrated solar power (CSP) TOWER systems (NEXTOWER) project is a four-year research and development project, funded by the European Commission, which aims at demonstrating high-performance durable materials for the next generation of concentrated solar power (CSP) air-based tower systems, making them commercially competitive in the energy market beyond 2020.

NEXTOWER comprises two main parts: steel and ceramic. The main objective related to ceramic is to develop new mechanically tough and highly thermally conductive ceramic receivers, working under extreme thermal cycling without failure at a maximum operating temperature of up to 1 400 °C and delivering up to 25 years of continued operation.

A general objective in NEXTOWER is the exploitation and standardization, addressing the integration of NEXTOWER in the standardization system.

Some of the results obtained in NEXTOWER regarding the use of advanced ceramics are:

1. Innovative ceramic for high-temperature open volumetric receivers based on all-SiC honeycomb manufactured by a mix of extrusion and slip casting through re-crystallization SiC more resistant to oxidation; better ceramics for high-temperature receivers, with superior thermal properties and reliability. Ceramic receivers optimized for oxidation, in terms of porosity and strength.

2. Innovative ceramic for high-temperature open volumetric receivers based on more flexible siliconized silicon carbide (Si-SiC) multiparts made by additive manufacturing (3D printing), especially designed for higher toughness, higher thermal conductivity and thermal shock resistance through a more open structure, with an optimized joining technique, improving lifetime and avoiding interfacial cracking.

3. Coating and surface treatments to improve thermomechanical properties and emissivity.

4. Proposal to amend ISO 18755 “Fine ceramics (advanced ceramics, advanced technical ceramics) – Determination of thermal diffusivity of monolithic ceramics by laser flash method”.

5. This CWA defines a methodology for testing the performance of the material ceramic materials and will be one of the standardization results. Both the standards community and NEXTOWER partners will benefit from it.

1 Scope

This document defines the requirements, operation and analysis for high temperature accelerated ageing of ceramic specimens for solar receivers and other applications under concentrated solar radiation, reaching a solar concentration up to 1 MW/m^2 peak and temperatures up to 1 400 °C.

This document also describes the structural and resistance post analysis of the irradiated samples.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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