ESR number and name surname: ESR14 – Soheil Samadi
Supervisors: Dr. Shengli Jin
Home university: Montanuniversity of Leoben

Uniaxial tensile creep test

Introduction

The uniaxial tensile creep test allows investigation of creep behaviour in high temperature and under tensile force. Beforehand, there has been no standardized methods for describing the high temperature tensile creep behaviour of heavy ceramic refractory materials. According to the material characteristics, accurate and long term measurements of small dicplacements at high temperatures (up to 1600°C) with a suitable alignment (to avoid bending), and applying uniform uniaxial stresses, are essential; which are considered in design of current test apparatus. [1,2].

Sample Preparation

The Design of specimen shape was completed with help of simulation in order to ensure the viability of the tensile creep measurements. The specimen is a cylinder with 30mm diameter (sufficient due to the size of biggest grains) and 230mm height drilled from bricks; considering that only 100mm of the middle part of the sample is heated by furnace. Then the sample together with water cooled adapters are aligned and glued onto the fixing device (Figure 1); the fixing device keeps the sample perfectly straight.

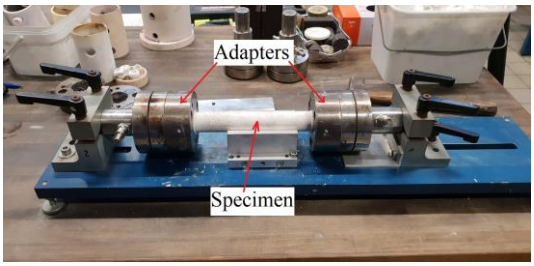

Figure 1– Sample's preparation.

Test Procedure

The testing apparatus is shown in Figure 2. Firstly, the specimen is introduced in the test machine at a vertical orientation. Heating of the specimen with 5°C/min to testing temperature is the next step; also 1 hour holding time is considered for homogenization of temperature in the specimen. Then the desired load is applied and two extensometers measure the displacement in the surface of the sample (Sensor arm distance: 50 mm).

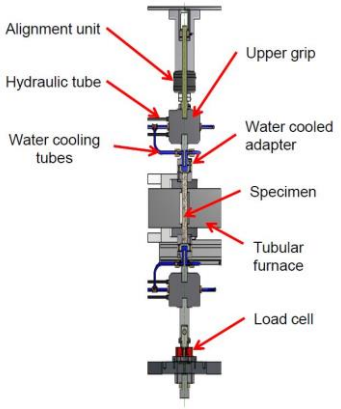

Figure 2– Tensile creep test apparatus.

Expected Result

The diagram below shows a typical result of a uniaxial tensile creep test (Figure 3). After obtaining strain/time data, these data are employed with an inverse evaluation method in order to determine the creep law parameters.

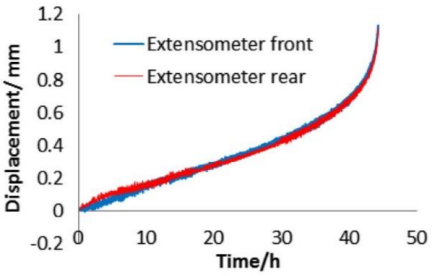

Figure 3 – Expected results.

Acknowledgement

This experiment was performed during Ph.D. studies in the framework of ATHOR project. This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement no.764987

References

[1] A. Sidi Mammar, D. Gruber, H. Harmuth, S. Jin, Tensile creep measurements of ordinary ceramic refractories at service related loads including setup, creep law, testing and evaluation procedures, Ceramics International 42 (2016) 6791-6799.
[2] A. S. Mammar, Investigation of high temperature tensile creep of refractories, Doctoral Thesis, Montanuniversitaet Leoben (2016).

European Commission | Horizon 2020 European Union funding for Research & Innovation