

# Uniaxial Fatigue Testing of NBG18 Nuclear Grade Graphite

D.G. Hattingh<sup>1</sup>, A Els-Botes<sup>1</sup>, J Roberts<sup>2</sup>, W Rall<sup>1</sup>, G Gouws<sup>1</sup>

<sup>1</sup> Faculty of Engineering, the Built Environment and Information Technology  
Nelson Mandela Metropolitan University, South Africa  
[danie.hattingh@nmmu.ac.za](mailto:danie.hattingh@nmmu.ac.za)

<sup>2</sup> Faculty of Engineering North-West University (Potchefstroom Campus)

## Abstract

This presentation will report on the test method and results of a study into fatigue behavior of uniaxial fatigue tests performed on NBG18 nuclear grade graphite. The first part of the presentation will address set-up conditions and sample preparation while the later part will address results obtained.

Due to the lack of available data on the fatigue properties of this grade of graphite the purpose of the uniaxial fatigue tests was to verify the strength characteristics and to determine the fatigue strength of this material by uniaxial loading in the two dominant directions. The stress basis for estimating the test loads was the Maximum and/or Minimum Principle stress.

For NBG18 material to be effectively used in nuclear power plant design, fatigue properties need to be accurately established. Uniaxial fatigue tests were conducted at various R-ratios and the results plotted on a log-normal scale. Testing revealed that the material exhibited a wide range in results (per load setting) at most R-ratios tested. All the fractures initiated in the parallel section of the fatigue specimen. This presentation discusses the difficulties experienced during experimental setup as well as graphical representations of the results obtained and its significance in relation to design criteria.