

An investigation of the nonlinear creep damage accumulation of different materials: Application of a novel damage model

Xu Zhao¹, Xuming Niu¹, Yingdong Song¹, and Zhigang Sun¹

¹Nanjing University of Aeronautics and Astronautics

June 4, 2021

Abstract

Variable creep load is one of the most important failure modes for hot-component of aero-engine. To accurately predict creep damage and remaining life, a novel nonlinear creep damage accumulation model is proposed based on the Wilshire function and isodamage line, which takes the influence of load history into account and uses ultimate tension strength to compensate the temperature effect. Experimental result of tests on four kinds of material were utilized to verify the accuracy of the proposed model and to compare it with existing models. It was determined that the novel model was better at predicting damage accumulation than all others model. Furthermore, the proposed model elucidates the evolutionary process of creep damage, and four cases of damage evolution process are discussed.

Hosted file

Manuscript.doc available at <https://authorea.com/users/417892/articles/524812-an-investigation-of-the-nonlinear-creep-damage-accumulation-of-different-materials-application-of-a-novel-damage-model>

Hosted file

Table.docx available at <https://authorea.com/users/417892/articles/524812-an-investigation-of-the-nonlinear-creep-damage-accumulation-of-different-materials-application-of-a-novel-damage-model>

Hosted file

Figure.pdf available at <https://authorea.com/users/417892/articles/524812-an-investigation-of-the-nonlinear-creep-damage-accumulation-of-different-materials-application-of-a-novel-damage-model>