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Understanding the hygrothermal aging effects and lifetime prediction on a NASA standard initiator JUYOUNG OH, JACK YOH, Seoul National University — The NASA standard initiator utilized in airbags of automobiles or as pyrotechnics in launch vehicles such as rockets and missiles contributes to assuring ignition of the more-difficult-to ignite substances in the system. The designed performance, however, has shown to degrade due to oxidization of metal powder fuel, changes in material properties, and premature reactions in their chemical constituents, all of which contribute to so-called aging process. Earlier studies have focused on the analysis of aging mechanism of the accelerated aging samples at ad-hoc thermal conditions. However, moisture is believed to play an impacting role, and such the role of relative humidity (RH) must be understood as the samples are exposed to the environment of seasonal changes during manufacturing and storage. The current study is motivated to provide the useful insight into understanding the hygrothermal aging of the zirconium potassium perchlorate (ZPP), better known as a NASA standard initiator. The lifetime of ZPP, heated at 71 C and exposed to four different RH conditions (0, 30, 70, and 100%), is predicted. The combustion process and changes in thermodynamic properties were analysed by utilizing the thermograms of Differential Scanning Calorimetry.

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