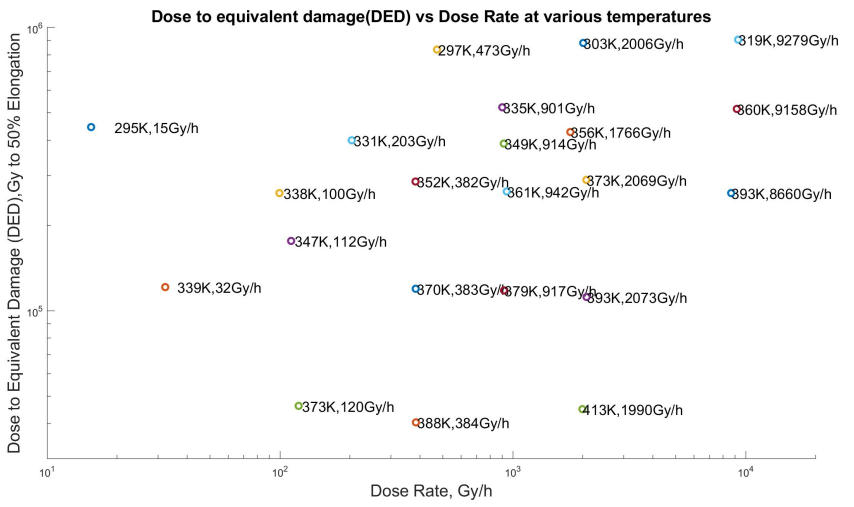
# Dose to Equivalent Damage in combined thermal and radiation environments

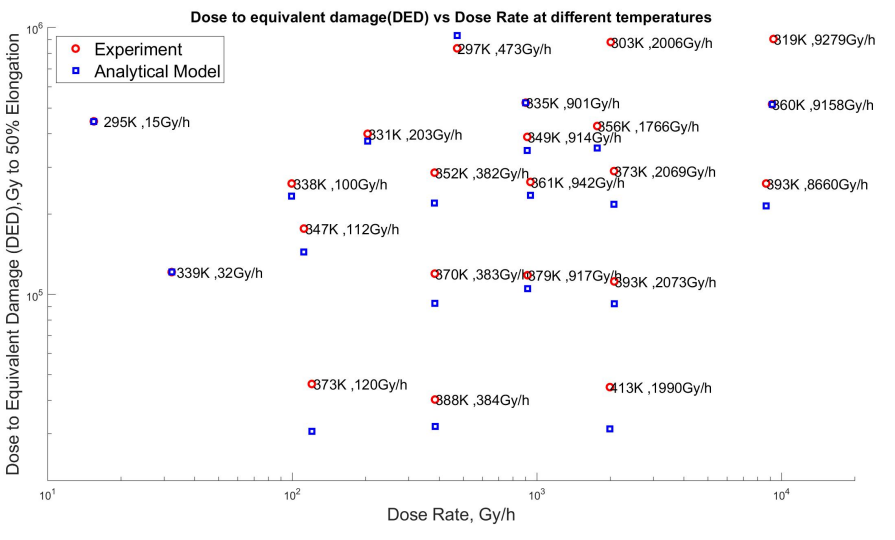
## *Challenge*

Polymeric materials are expected to last for decades in air environments. Therefore, there have been efforts in developing methods to make lifetime predictions using accelerated aging techniques. However, such predictions are difficult to make in the presence of two degrading environmental factors. The Dose to Equivalent Damage or DED approach is one such approach used to make lifetime predictions in combined thermal and radiation environment. Even though experimental results from this approach is vast, the challenge lies in making predictions using analytical methods.

## *Solution*

The K-Extreme survivability predictor was used to make lifetime predictions of polymeric materials. In particular, the predictions were made for chloroprene rubber. K-Extreme combined analytical and machine learned models to make such lifetime predictions. The predicted results were validated with experimental results from [1]. The DED for 50% elongation of the chloroprene rubber material was determined from our software and compared against experimental results and good correspondence between the two results was observed. Further, normalized elongations obtained from experiments were compared with our solutions and there was a very good agreement between the two results. Further, the computational time required to run our simulations was less than a minute indicating the robustness of the software.

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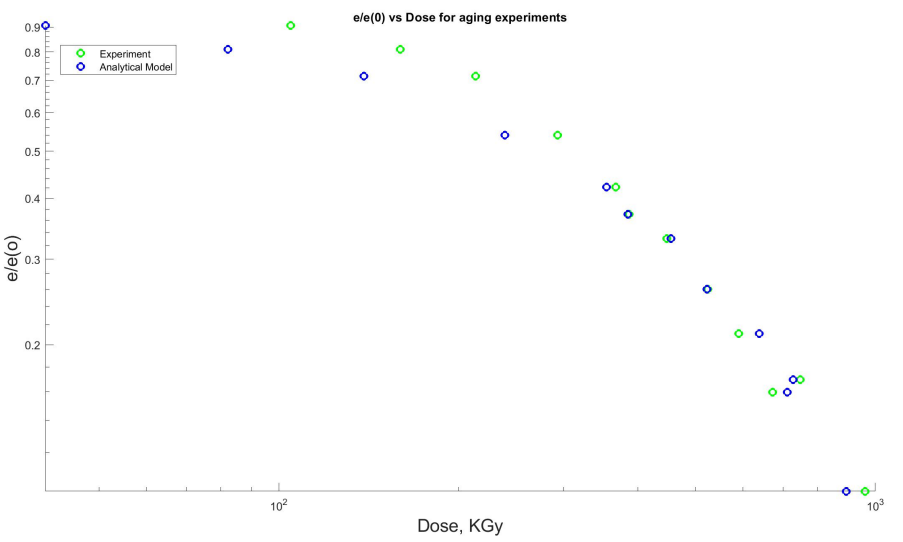
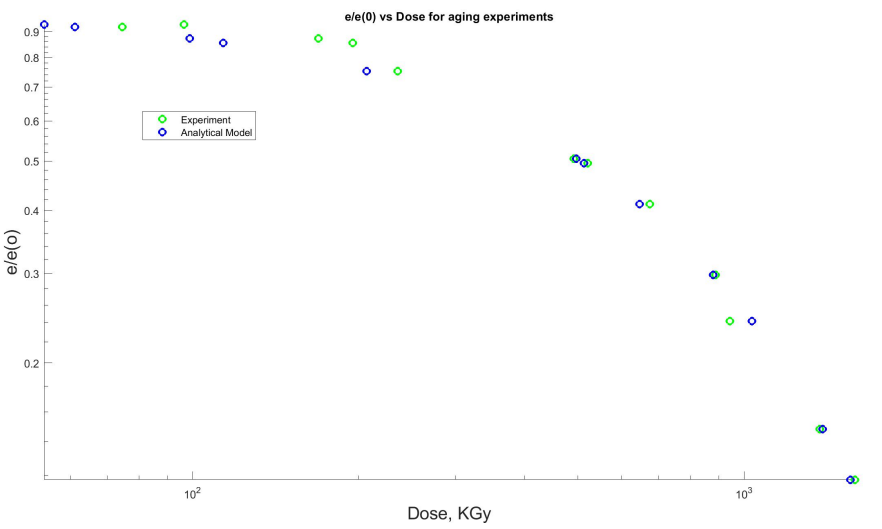
## *Results and Conclusion*

The K-Extreme survivability predictor was able to predict the DED for 50% elongation for chloroprene rubber. The results compared well with experimental results from [1]. The computational time required to make these predictions was less than a minute.




## *Key Highlights and Benefits*

Product: K-Extreme
Industry: Nuclear, Space
Benefits: Survivablity predictions against Single event effects




## *Reference*

Kenneth T Gillen, Mathew C Celina, Issues with Approaches for Simulating Aging of Nuclear Power Plant Cable Materials

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