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Dynamic Analysis of Granular Battery Assembly (GBA)

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ABSTRACT

Collisions and impacts are an inevitable reality when it comes to commercial cars and vehicles, but as batteries become more prevalent it is vital to understand how they react dynamically and as a system to better protect both the passengers and toxic chemicals inside of the batteries. One potential solution is to surround these batteries with non-vital tubes that can be sacrificed and help protect the batteries. This study is done to understand the structure of batteries and to test how an assembly of sacrificing cells and batteries reacts in an impact situation to see if there is significant energy absorption to justify their use. Several methods were used to analyze the structures of both batteries and sacrificing tubes. First, the individual batteries and tubes underwent both static and dynamic testing. The force versus deflection was then found and from that the energy absorption could be calculated. It was found that the battery assembly absorbs significantly more energy than the base system; however, the thickness of the sacrificing tube plays a big role in the impact. If the tubes are too thin relative to the forces applied, then they are too easily deformable and act as a solid material. On the other hand, if they are too thick, then they will not deform fully. So it was found that depending on the forces involved, different tube thicknesses should be chosen. Additional work can be done on different assemblies at different forces and energies.

KEYWORDS

Impact, Battery, Assembly, Dynamic, Granular Battery Assembly

REFERENCES

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