Mathematical Modelling of Energy Release for Mixed Energetic Material in a Closed Vessel

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Metal/Oxidizer energetic materials are mainly used as propellants in aerospace area because they can release high energy in a few micro-seconds in a closed vessel. The energy release performance of the energetic material plays an important role in the rocket motor design. Among materials, $ZrKClO_4$, TiH_2KClO_4, $BKNO_3$ have been widely used for decades. $ZrKClO_4$ has advantages of simple ignition characteristics and high energy density but has large performance deviation. TiH_2KClO_4 and $BKNO_3$ have relatively low energy but have small performance deviation because of its stability. These propellants are tried to use in the mixed form of $ZrKClO_4$/TiH_2KClO_4 and $ZrKClO_4$/$BKNO_3$ to increase the stability of energy release. However, despite the importance of estimating performance, the existing models are based on empirical equation. In this study, we suggest the theoretical model to estimate the energy release performance of mixed energetic materials. The model is compared with the experimental results for verification.