Final Report

Project submitted to the Embedded Systems Competition (ESC) of SBESC 2020

Project Title：

Students:

Professor:

University:

JEMS ID:

Declaration of Originality

We hereby declare that this report and the work reported herein was composed and originated entirely by ourselves. Information derived from the published and unpublished work of others has been acknowledged in the text and a list of citations is given in the references section

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Abstract

HCCI (Homogenous Charge Compression Ignition) combustion has advantages in terms of efficiency and reduced emission. HCCI combustion can not only ensure both the high economic and dynamic quality of the engine, but also efficiently reduce the NOx and smoke emission. Moreover, one of the remarkable characteristics of HCCI combustion is that the ignition and combustion process are controlled by the chemical kinetics, so the HCCI ignition time can vary significantly with the changes of engine configuration parameters and operating conditions. In this work numerical scheme for the ignition and combustion process of DME homogeneous charge compression ignition is studied. The detailed reaction mechanism of DME proposed by American Lawrence Livermore National Laboratory (LLNL) and the HCT chemical kinetics code developed by LLNL are used to investigate the ignition and combustion processes of an HCCI engine fueled with DME. The new kinetic mechanism for DME consists of 79 species and 399 reactions. To consider the effect of wall heat transfer, a wall heat transfer model is added into the HCT code. By this method, the effects of the compression ratio, the fuel-air equivalence ratio, the intake charge heating, the engine speed, EGR and fuel additive on the HCCI ignition and combustion are studied. The results show that the HCCI combustion fueled with DME consists of a low temperature reaction heat release period and a high temperature reaction heat release period. It is also founded that increasing the compression ration, the equivalence ratio, the intake charge temperature and the content of H_2O_2, H_2 or CO cause advanced ignition timing. Increasing the engine speed, adoption of cold EGR and the content of CH_4 or CH_3OH will delay the ignition timing.

Keywords: HCCI, chemical kinetics, numerical simulation, DME, EGR

Content

1. Introduction

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(1) Introduction
(2) Introduction

2. System Description

2.1 System Description

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See equation template in equation (2-1). In Table 2-1 one can see table template and in Figure 2-1 one can see figure template.

$$m = \sum_{k=1}^{K} m_k \qquad (2-1)$$

Table 2-1

ITEM	H_F(KCAL/MOL)	S_F(KCAL/MOL)	C_P(KCAL/MOL)
A1	100	100	100
A2	200	200	200
A3	300	300	300
A4	400	400	400
A5	500	500	500
A6	600	600	600
A7	700	700	700
A8	800	800	800

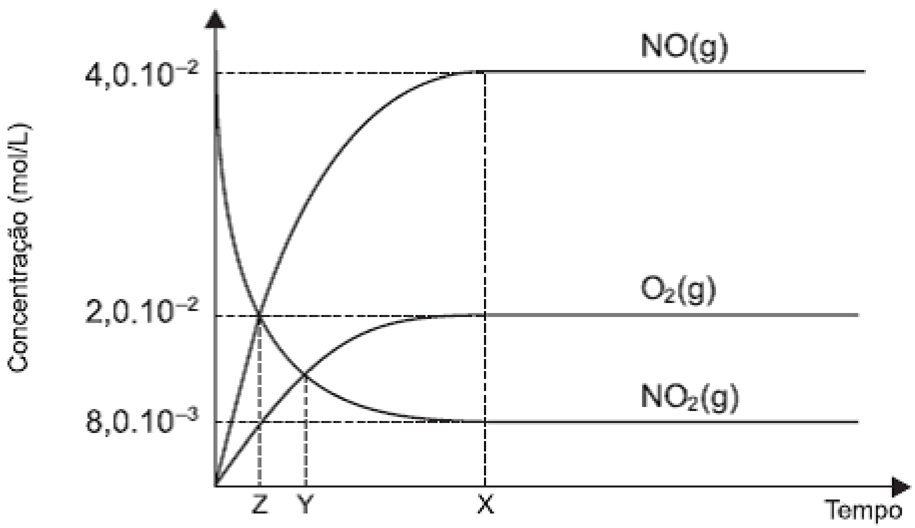

Figure 2-1 Caption

3. System Implementation

Describe implementation here...

4. Results

Describe results here...

5. Conclusion

Conclusions here...

References

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