COMPUTIONAL METHODS IN COMBUSTION

Zeldovich-von Neumann-Doring model of detonation

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1 Introduction

This report gives information about ZND detonation model of oxygen and hydrogen mixture. The study provides calculations using connection between detonation cell size and induction time. Induction time will be calculated.

2 Mathematical model

ZND code has been downloaded from Caltech website, it's program calculating simple detonation, has been published for the first time in 1944.
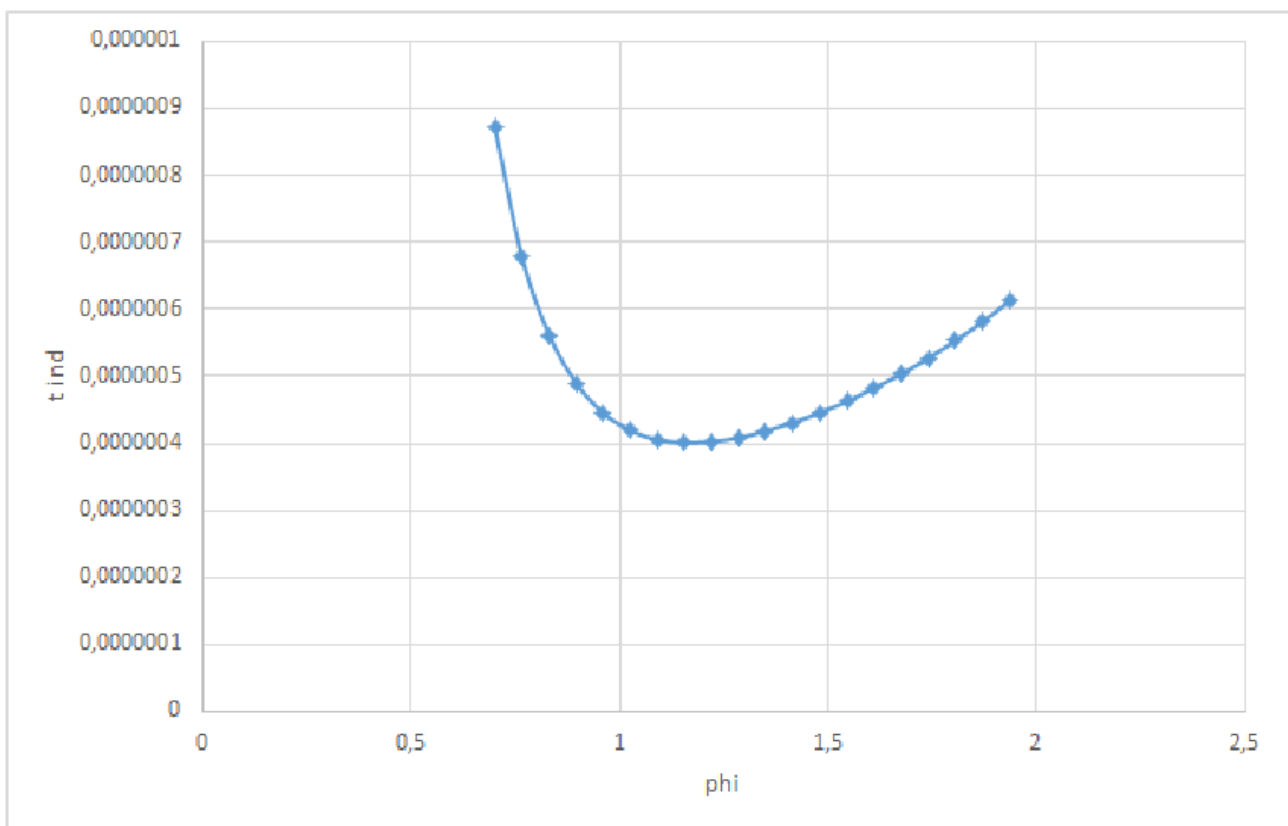
3 Results

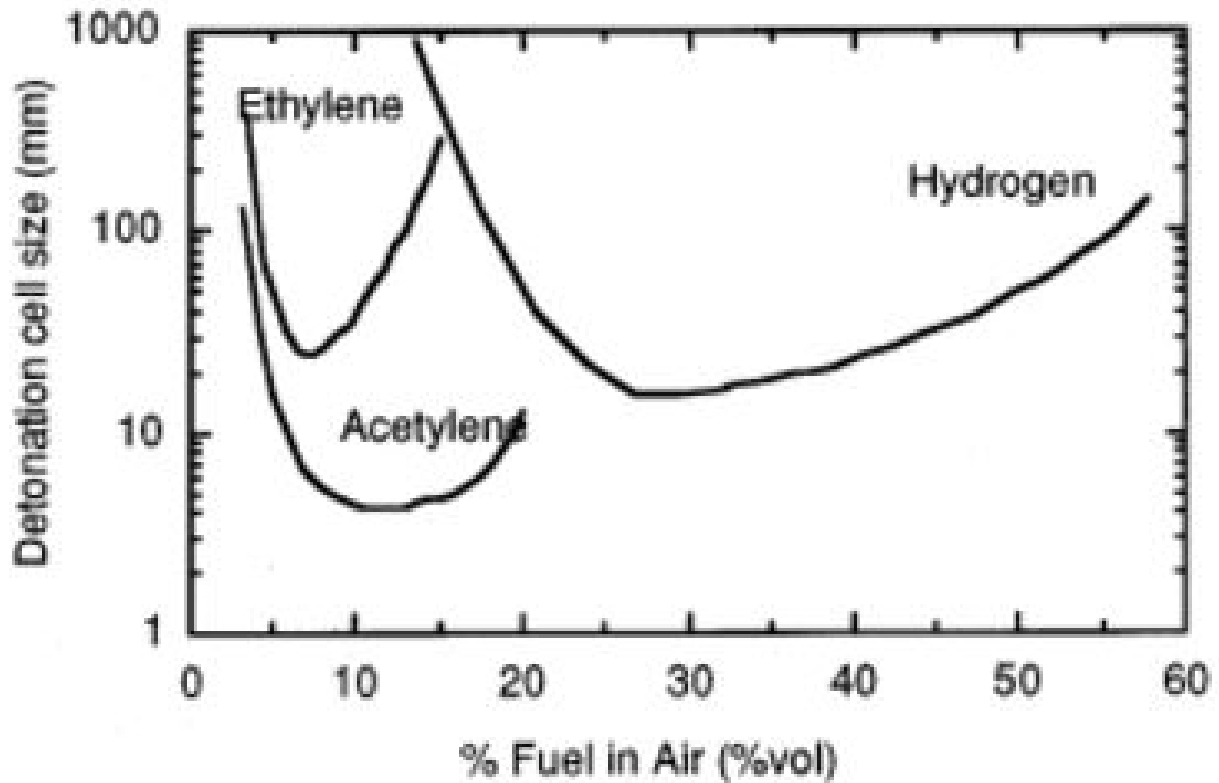

Figure 1: Calculated ZND detonation

Figure 2: Experiments data

These two charts have similar properties. There is a relation which will be calculated below:

$$a = \frac{t_{ind}}{\lambda} = \frac{7,77 * 10^{-8}}{0,0121} = 6,65 * 10^{-6} \tag{1}$$

4 Summary

Program for calculating ZND detonation produced related to experiments results. Induction time happened to be measured in s^{-8}. Detonation of hydrogen with oxygen is extremely fast, this is why this mixture is called Knallgas (Scandinavian and German Knallgas: "bang-gas").

5 References

[1] ZND program
$http://shepherd.caltech.edu/EDL/public/cantera/html/SD_Toolbox/ZND$
    [2] Properties of Hydrogen
http://www.cnbyxf.com/Doc/data.WebNoteBooks2010/07/20100728122525