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An Experimental Study on the Ignition Characteristic of Ignition Plug

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Key Words: Ignition energy(), Capacitive discharge energy(), Inductive discharge energy()

Abstract

Harmful elements from the exhaust gases are caused by incomplete combustion of mixture inside the engine cylinder and this abnormal combustion like misfire or partial burning is the direct cause of the air pollution and engine performance degradation. In this study, I obtain the shapes of spark, voltage and current generated when changing the experimental parameters such as grounded electrode shapes, electrode gap and the material of center electrodes. After that, I produce ignition energy by using the voltage and current and classify ignition energy into capacitive discharge energy and inductive discharge energy.

W :	, mJ	t :	, ms
V :	, V	C :	, F
V_b :	, V		
V_i :	, V		1.
I :	, mA		

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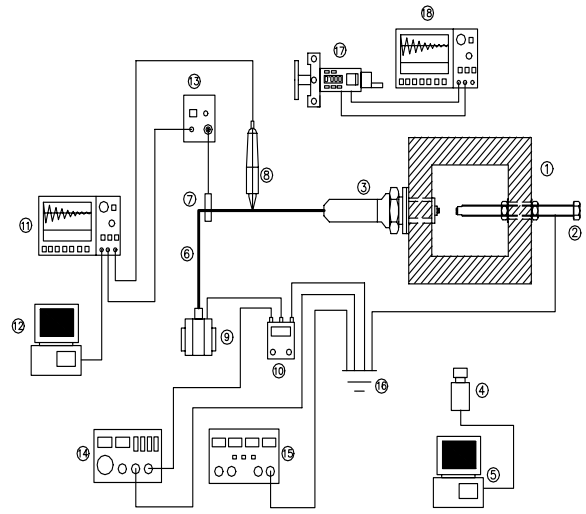
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Warner (1)

Richard (2)
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R. J Takaczyski(3)



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DC Power Supply 16 GND

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Fig. 1 Schematic diagram of experimental setup

Han(4)

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(5-6)

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Fig. 1

(7-8)

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trade-off

(Cu)

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(Y)

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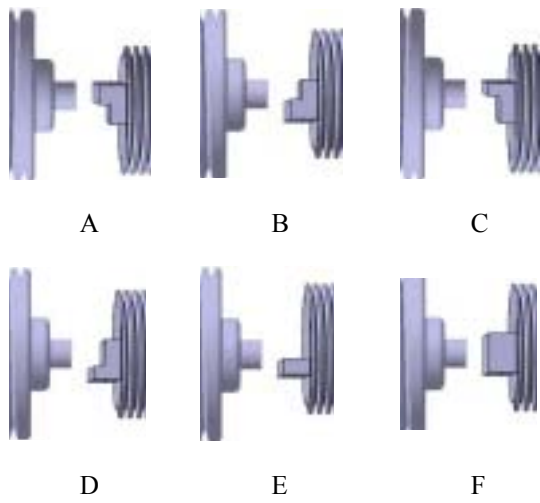


Fig. 2 Changes of ground electrode shape

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0.2mm
0.6-1.6mm

Table 1

Table 1. Test conditions

Experimental variables	Experimental Conditions
Center electrode	Cu, Y
Electrode gap	0.6, 0.8, 1.0, 1.2, 1.4, 1.6mm
Ground electrode shape	A, B, C, D, E, F

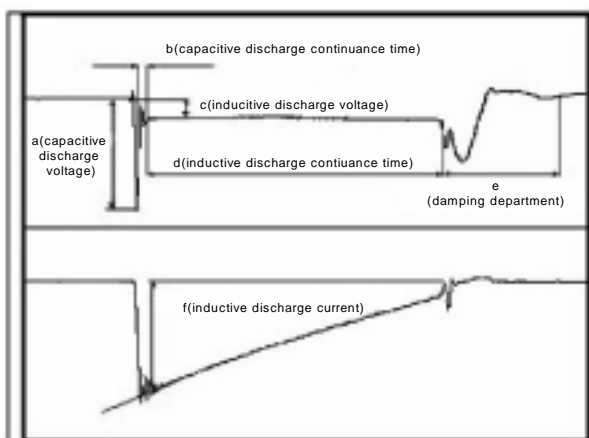


Fig 3. The schematic diagram of spark breakdown wave forms

Fig. 3

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Fig. 4 (Cu) (Y)
0.6, 1.2, 1.6mm

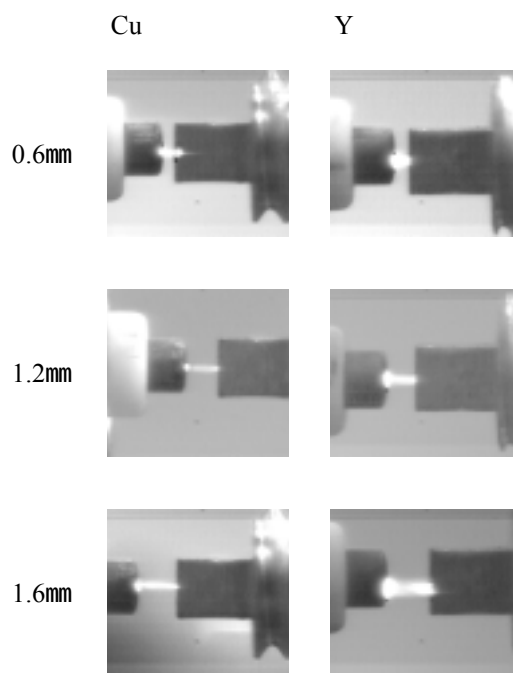


Fig. 4 The effect of center electrode on the spark shape

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Fig. 5

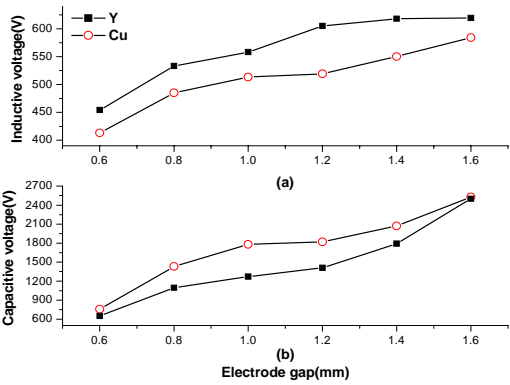


Fig. 5 The effect of electrode gaps on the discharge voltage(Center Electrode : Cu, Y)

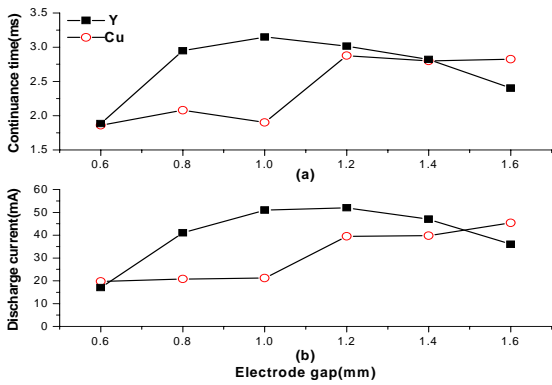


Fig. 6 The effect of electrode gaps on the continuance time and discharge current(Center Electrode : Cu, Y)

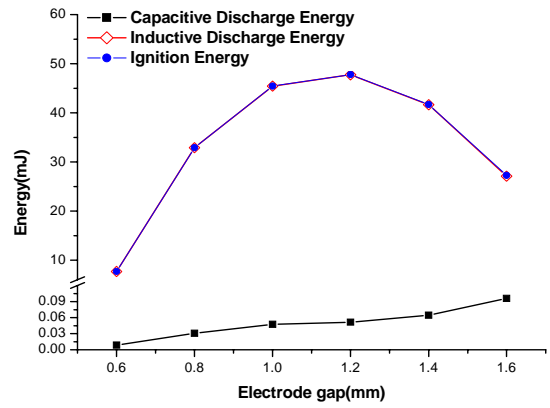


Fig. 7 The effect of electrode gaps on the energy (Center Electrode : Y)

Fig. 6

Fig. 6

Fig. 7

Fig. 8

Fig. 9

1.2mm

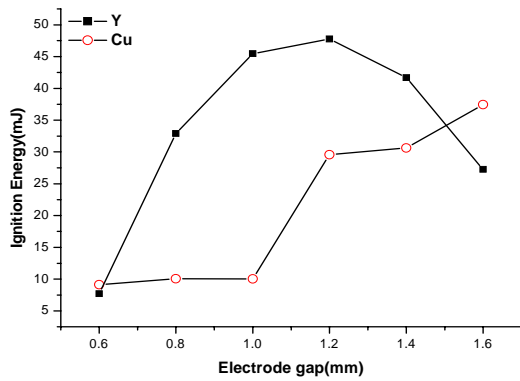


Fig. 8 The effect of electrode gaps on the ignition energy(Center Electrode :Cu, Y)

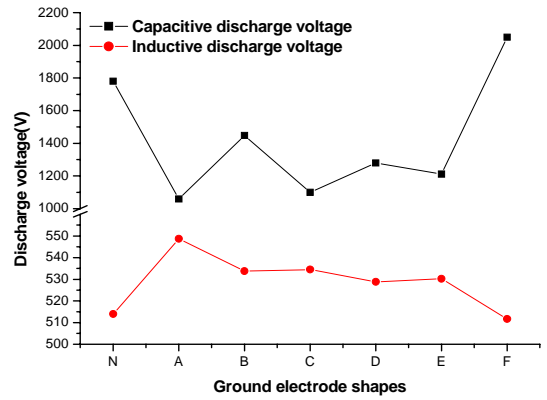


Fig. 10 The effect of ground electrode shape on the discharge voltage

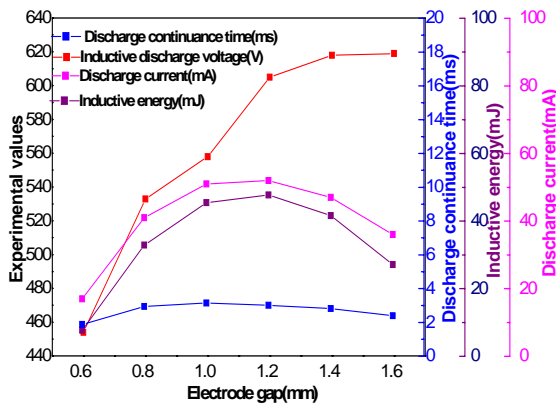


Fig. 9 The relative correlation between inductive ingredients and inductive discharge energy

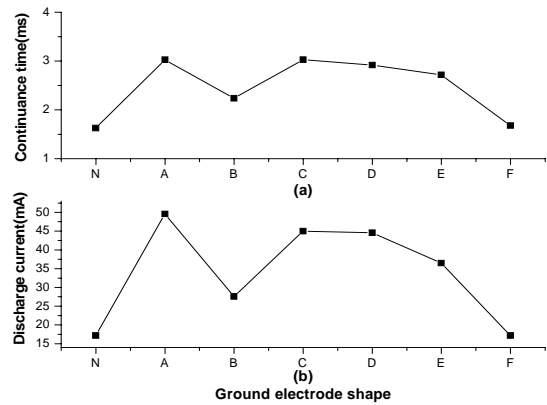


Fig. 11 The effect of ground electrode shape on the continuance time and discharge current

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Fig. 10

(A-F) (N)

Fig. 11

(N)

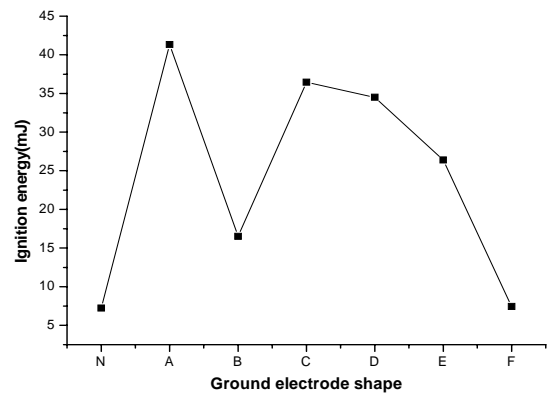
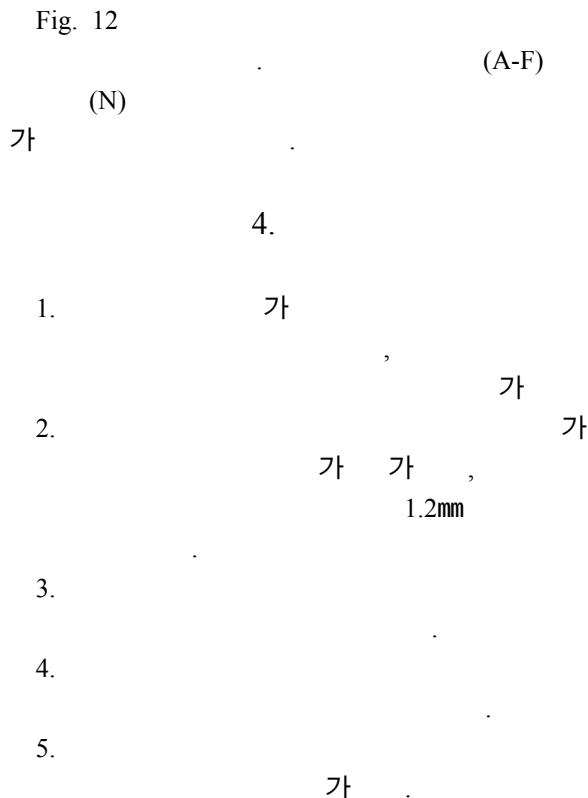


Fig. 12 The effect of ground electrode shape on the ignition energy



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