DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH AND FIRE OFFICES' COMMITTEE
JOINT FIRE RESEARCH ORGANIZATION

THE FLAMMABILITY LIMITS OF MIXTURES OF N-HEXANE AND DIFLUOROCHLOROBROMOMETHANE IN AIR

by

G. H. J. Elkins

Summary

The effects have been measured of pure and impure difluorochlorobromomethane on the flammability limits of n-hexane.

August, 1957.

Fire Research Station,
Borehamwood,
Herts.

THE FLAMMABILITY LIMITS OF MIXTURES OF N-HEXANE AND DIFLUOROCHLOROBROMOMETHANE IN AIR

by

G. H. J. Elkins

INTRODUCTION

A request was received for information on the effectiveness of difluorochlorobromomethane, CF_2ClBr, as a fire extinguishing agent. Since little information was available, the effects of two grades of CF_2ClBr. on the flammable limits of n-hexane in air have been measured.

PRESENT WORK

The effects of CF_2ClBr on the flammability of n-hexane in air has been measured in the standard tube apparatus (1). Two grades of agent, provided by Imperial Chemical Industries Ltd. were used, one of high purity and the other stated to contain approximately 25 per cent of difluorodibromomethane, CF_2Br_2. The physical properties of n-hexane and CF_2ClBr. are given in Table 1.

TABLE 1

The Physical Properties of n-Hexane and Difluorochlorobromomethane

Compound	Mol Wt.	Liquid Density g/ml	Boiling Point °C.	Flash Point Closed Cup °C	Flash Point Closed Cup °F	Flammable Limits per cent by volume Lower	Flammable Limits per cent by volume Upper	Vapour Pressure mm.Hg. at °C 0	10	20	30
n-Hexane C_6H_{14}	86.17	.66	68.7	-22	-7	1.5	7.5	45	75	135	190
Difluorochlorobromomethane CF_2ClBr	165.4	1.83	-4	-	-	-	-	760 at room temperature			

RESULTS

The results obtained are given in Table 2. Data for other similar compounds are given for comparison.

TABLE 2

Peak values of n-hexane in air

Compound	Conc. of inhibitor per cent by volume	Conc. of n-hexane per cent by volume
CH_3Br.	7.1	2.1
CF_3Br.	4.9	2.9
CF_2ClBr. (pure)	5.2	3.2
CF_2ClBr. (impure)	3.8	3.6
CF_2Br_2	3.55	3.2

The flammable limits curves for mixtures of n-hexane with both grades of CF_2ClBr, are shown in Figs. 1 and 2. With the pure material the peak value occurs at 5.2 per cent of agent and at 3.8 per cent with the impure material. Both curves exhibit the inflexions with rich mixtures which is typical of brominated compounds.

DISCUSSION

The peak value of the pure difluorochlorobromomethane is 5.2 per cent but the mixture of this agent containing 25 per cent of difluorodibromomethane has a peak value of 3.8 per cent. This is close to the value for the latter compound (3.55 per cent). The efficiency of the mixture is, therefore, considerably higher than that of the pure compound and than the value which would be expected from the purely additive effects of the two components of the mixture. The commercial material should, therefore, be a highly efficient extinguishing agent and probably more efficient than the purified material.

REFERENCES

1) The effects of certain halogenated hydrocarbons on the inflammability limits of n-hexane in air. E. H. Coleman. F.R. Note No. 1/1952.

1/27[illegible] R. 32)

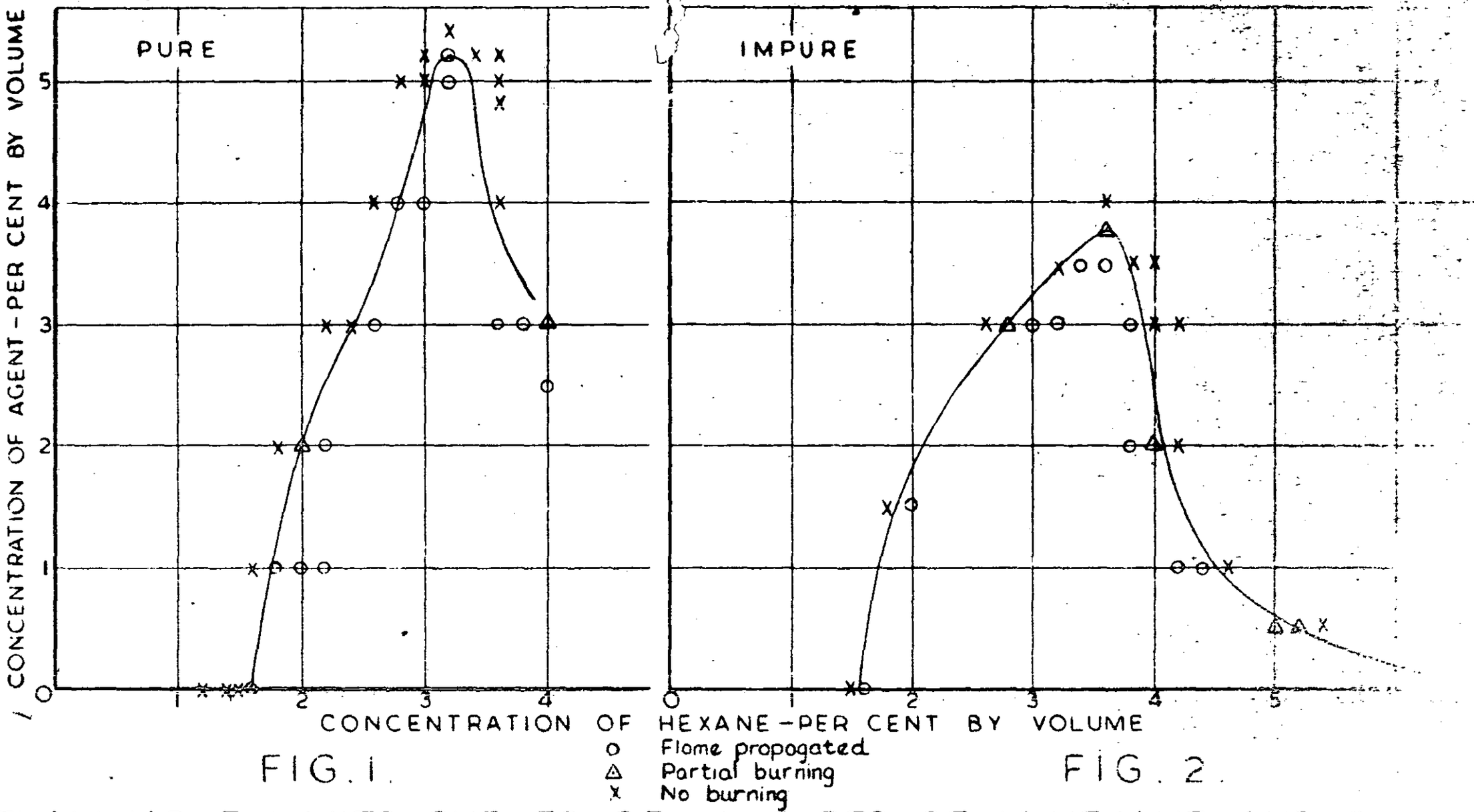

FIG. 1

FIG. 2

FLAMMABLE LIMITS CURVES OF MIXTURES OF N-HEXANE AND [illegible]
AND IMPURE DIFLUOROCHLOROBROMOMETHANE