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DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH AND FIRE OFFICES' COMMITTEE
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EXTINCTION TRIALS WITH A MIXTURE OF DIFLUOROCHLOROBROMOMETHANE
AND DIFLUORODIBROMOMETHANE

by

E. H. Coleman and Z. W. Rogowski

Summary

Some trials have been made to evaluate the fire extinguishing effectiveness of a difluorochlorobromomethane mixture containing 25 per cent of difluorodibromomethane. Although the amount of material available was insufficient for a complete series of tests the results indicate that the mixture is a promising extinguishing agent.

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Introduction

The effects of pure difluorochlorobromomethane (CF_2ClBr) and of a mixture with 25 per cent of difluorodibromomethane (CF_2Br_2) on the flammable limits of n-hexane have been reported (1). In order to evaluate the mixture as an extinguishing agent its effectiveness has been compared with that of chlorobromomethane in extinction trials on petrol fires.

The properties of chlorobromomethane and of the constituents of the mixture are given in Table 1. Except for its peak value, no information was available for the mixture.

Table 1

The properties of chlorobromomethane, difluorochlorobromomethane, and difluorodibromomethane

	Chlorobromomethane CH_2ClBr (2)	Difluorochlorobromo- methane CF_2ClBr (2)	Difluorodibromomethane CF_2Br_2 (2)
Boiling point °C	68.7	-4	24.5
Vapour pressure mm.Hg/15°C	11.5	1550	5.43
Density (liq) gm/cc	1.93	1.83	2.28
Peak value with n-hexane per cent vol.	6.4 (1)	5.2 (1)	3.55 (1)
Peak value with n-hexane per cent vol. of mixture			3.8 (1)

Experimental

The fire was two litres of petrol burning in a steel tray 46 cm. diameter and was given 15 seconds preburn before applying the agent.

The agents were applied through a manually operated applicator carrying a pair of No. 1 Bray gas burners arranged to produce a semicircular flat spray. The vessel containing the liquid was pressurized to 20 lb/in² with nitrogen. This gave a nozzle pressure of 8 lb/in² with chlorobromomethane and 10 lb/in² with difluorochlorobromomethane mixture. Because of its low boiling point the mixture was cooled to -10°C and the pressure vessel was stood in a freezing mixture so that the agent was discharged as a liquid.

The manual application was adopted after preliminary trials with nozzles fixed round the fire had shown that experiments to design suitable apparatus to give reproducible results would require more agent than was available. The results of the trials are given in Table 2.

Table 2

Nozzle pressure lb/in ²	Chlorobromomethane			Difluorochlorobromomethane		
	8			10		
Delivery rate ml/sec	12.8			7.5		
gm/sec	24.8			13.8		
Test No.	Extinction time sec.	Amount used		Extinction time sec.	Amount used	
		Wt. gm.	Vol ml.		Wt. gm.	Vol ml.
1	9.5	236	122	22.5 [≠]	310 [≠]	169 [≠]
2	7.0	173	90	10.5	145	79
3	4.5	112	58	8.6	118	65
4	5.5	136	71	5.8	80	44

[≠] Fire not extinguished.

When either of the agents was applied, the fire was swept quickly from the surface of the tray but flames persisted beyond it, and, until the technique of application had been acquired, attempts to extinguish these allowed the flames to flash back to the tray. There is thus a minimum time of extinction, and this has been noticed in other trials of this nature.

The minimum time of extinction depends upon the size of the fire, the ease with which the applicator can be handled, and wind conditions. The results with chlorobromomethane indicate that the technique was being acquired during tests 1 and 2, and that tests 3 and 4 represent the best times obtainable. This appears to be approximately 5 seconds. Because the physical properties of the two agents are different, the techniques required were different and test 4 with difluorochlorobromomethane mixture is considered to approximate to the minimum time with that agent.

Therefore, comparing the best results, the extinction times are similar although extinction required less difluorochlorobromomethane than chlorobromomethane.

The quantity of material available was not sufficient for a series of tests comprehensive enough for a complete evaluation, but the results show that the difluorochlorobromomethane mixture is a promising extinguishing agent and that it is probably more efficient than chlorobromomethane.

References

1. G.H.J. Elkins. The flammability limits of mixtures of n-hexane and difluorochlorobromomethane in air. F.R. Note No. 327/1957.
2. Kinetic Technical Bulletin B-4. Du Pont Nemours & Co. (Inc.) Wilmington, Delaware.