EXPERIMENTAL INVESTIGATION IN ZINC BORATE EFFECT ON FLAMMABILITY CHARACTERISTICS OF POLYMERIC COMPOSITE MATERIAL

Ali I. Al-Mosawi
Technical Institute-Babylon,
IRAQ.
aliibrahim76@yahoo.com

Abbas A. Sakhir
Al- Qadisiya University,
IRAQ.
Doctor_abbas2001@yahoo.com

Mushtaq T. Albdiry
University of Southern
Queensland, AUSTRALIA.
mushtaqalbdiry@yahoo.com

Tareq Majeed
Babylon governorate,
IRAQ.

ABSTRACT

The main aim of this paper is to investigate flammability enhancement of araldite composite material reinforced by kevlar-carbon fibers by addition of a surface coating layer (4mm) thick from zinc borate. This system was exposed to a direct flame generated from oxyacetylene flame and gas flame under different exposure intervals (10,15, and 20mm), and study the range of resistance of flame retardant material layer to the flames and protected the substrate where we used the method of measuring the surface temperature opposite to the flame where we obtained the better results with large exposed interval and large percentage from protective layer which is zinc borate (30%) for both types of flames , as well as the flame resistance will be increased with decrease the flame temperature .

Keywords: Hybrid Composite Material, Flame Retardant Material, Zinc Borate.

INTRODUCTION

Fire safety is an integral part of precautions. Fire precautions have the objective to minimize the number of and damage from measuring hindering their initiation, limiting their propagation and if possible excluding flash-over. Preventing fires or delaying them makes escape possible over a longer period of time. As a result, life, health, and property are efficiently protected (Troitzsch, 1998). Since plastics are synthetic organic materials with carbon and often high hydrogen contents, they are combustible. For various applications in the building, electrical, transportation, mining, and other industries, plastics have to fulfill flame retardancy requirements laid down in mandatory regulation and voluntary specification. The objective in flame retarding polymers is to increase ignition resistance and reduce rate of flame spread (Al-Maamori *et al.*, 2011).

One way to better protect combustible materials against initiating fires is the use of flame retardants , which are substances that can be chemically inserted into the polymer molecule or be physically blended in polymers after polymerization to suppress , reduce , delay or modify the propagation of a flame through a plastic materials. There are several classes of flame retardants; halogenated hydrocarbons (chlorine and bromine containing compounds and reactive flame retardants): inorganic flame retardants (boron compounds, antimony oxides, aluminum hydroxide, etc.); phosphorus containing compounds; nitrogen containing flame retardants (Al-Jeebory *et al.,* 2008).

FLAME RETARDANT MATERIALS

Flame retardants are substances used in plastics, textiles, electronic circuitry and other materials to prevent fires. There are several types of flame retardants as mentioned above, one of these types is inorganic flame retardants. Few inorganic compounds are suitable for use as flame retardants in plastics, since such compounds must be effective in the range of decomposition temperature of the plastic, mainly (150ºC - 400ºC). Inorganic flame retardants don't evaporate under the influence of heat ; rather they decompose ; giving off non-flammable gases like water , carbon dioxide , sulphur dioxide , hydrogen chloride , etc. mostly endothermic reaction. In the gas phase, these act by diluting the