Phosphorus-containing Polyimides

Shinsuke Inoue, Satoru Nanba*
MANAC Inc., Research Laboratory
92 Minooki-cho, Fukuyama, Hiroshima 721-0956 JAPAN
E-mail: s.inoue@manac-inc.co.jp
* 2-1-4 Kazusakamatari, Kisarazu, Chiba 292-0818 JAPAN
E-mail: s.nanba@manac-inc.co.jp

Abstract

New phosphorus-containing dianhydrides were synthesized. They were also polymerized with normal diamines (4,4'-ODA, BAPP), followed by film preparation (patents in press). Some of phosphorus-containing polyimides film using 4,4'-ODA resulted in fragile film. But phosphorus-containing polyimides film from BAPP has produced creasable film. Tg of these newly prepared phosphorus-containing polyimides was not so high, showed around 250°C. All of phosphorus-containing polyimides thin films (10 μm) have shown good flame retardant properties.

Introduction

Among the various phosphorus-containing aromatic compounds, phosphorus-containing aromatic diamines or epoxy resins are mainly used in epoxy resins for thermal stability and flame retardancy[1]. However, so far phosphorus-containing dianhydride is not known at all. Recently, we made new phosphorus-containing dianhydrides, and these phosphorus-containing anhydrides are polymerized with 4,4'-ODA, BAPP, respectively.

As well known, polyimides are flame retardant materials, but getting thin film, for example less 10μm the polyimide film reduces its flame retardancy. So we applied phosphorus-containing anhydrides for homo- or co-polyimide monomer.

The phosphorus-containing polyimide films had exhibited good flame retardancy. Phosphorus-containing anhydrides are used for co-polyimide monomer with silicone diamine resulting polyimide film had no ignition.

At present, we don't have enough data concerning phosphorus-containing polyimides characterization. In the coming conference we will present more data. The data of phosphorus-containing polyimides are shown below.

井上進介　難波悟*　マナック株式会社・新事業研究所

Examples of phosphorus-containing polyimides thermal analysis

The thermal analyses of the typical phosphorus-containing polyimide film are shown below. DSC and TMA are illustrated, respectively.

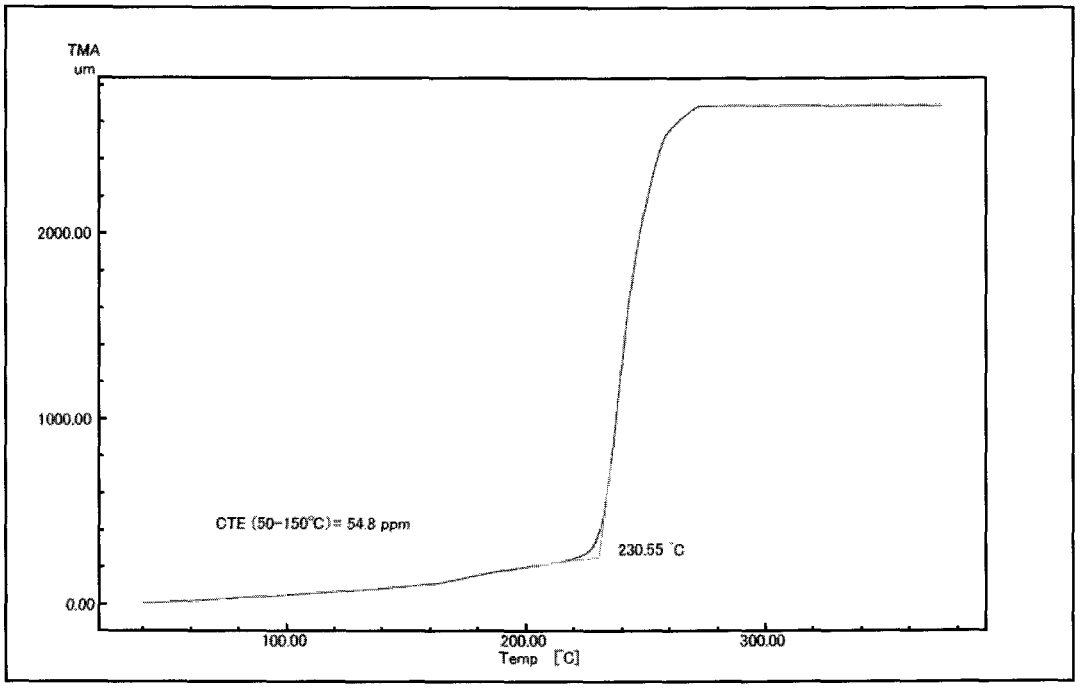

Fig 1 TMA measurement (air atmosphere) of phosphorus-containing polyimide film (diamine: BAPP)

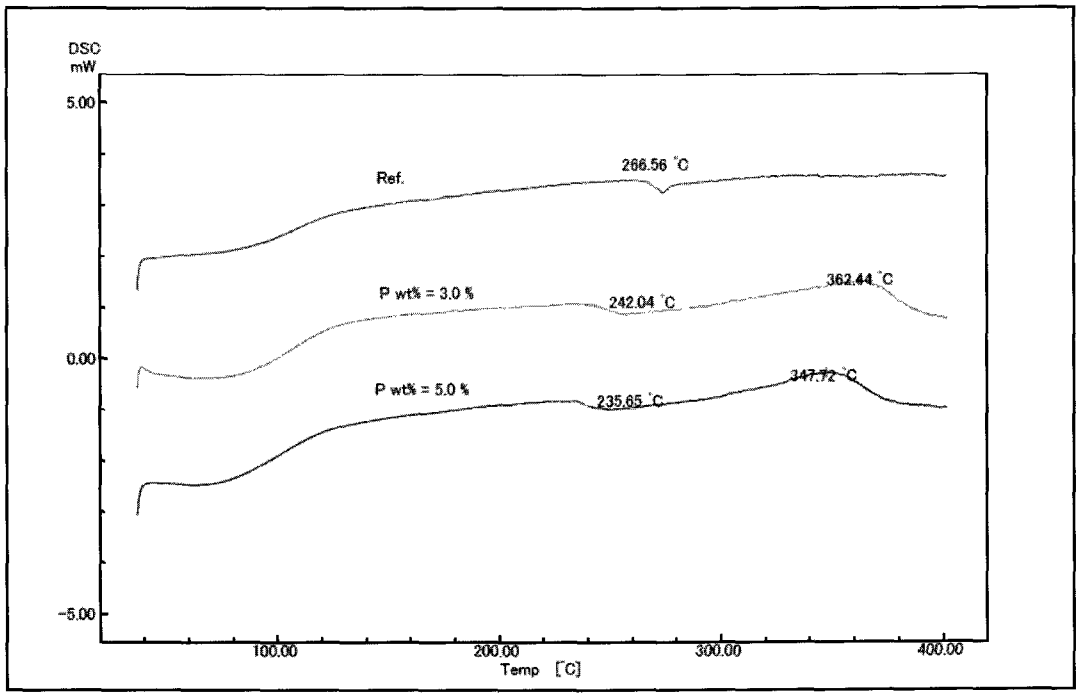

Fig 2 DSC measurement (N_2 atmosphere) of phosphorus-containing polyimide film (diamine: 4,4'-ODA)