Benzoxazine Chemistry: A New material to meet Fire Retardant Challenges of Aerospace Interiors Applications

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The trend to migrate from brominated FR-4 to halogen free systems in printed circuit boards (PCB) for environmental reasons is gaining considerable attentions especially in Japan and Europe where electronic wastes are typically incinerated due to landfill restriction. The generation of Dioxin, possibly resulting from inappropriate incineration conditions, is still remaining a major concern. Different types of flame retardant chemistry such as phosphorous, nitrogen, metal hydrate /oxide have been explored to substitute halogen. Recently Benzoxazine chemistry has been investigated extensively and successfully introduced into the halogen free PCB industry. Benzoxazines are the reaction products of amine, phenol and formaldehyde. It is well known that the Benzoxazine ring is stable at room temperature for a long period of time and starts to homo-polymerize to high molecular weight oligomer or polymer at elevated temperature. It is also important to recognize that ring opening polymerisation of Benzoxazine does not generate any volatiles due to addition reaction.Depending upon the backbone chemistry these systems can provide polymers with high glass transition temperature, low water absorption, excellent physical electrical performance along with excellent Fire Resistance properties. The flammability characteristics of Benzoxazine is very similar to that of Phenolic resin due to the formation of very similar net work created after polymerization. Benzoxazines is a candidate of choice for industries interested to replace phenolic resins because of toxicological issues in the workshops before or upon curing along with very good fire retardant properties. Aerospace industry uses huge quantities of phenolic pepregs to manufacture semi-structural interior parts which must satisfy the more stringent fire safety regulations (FST) such as flammability, smoke density and toxicity, and heat release properties. In this paper, we are planning to present our preliminary investigation results comparing Benzoxazine prepreg to an aerospace qualified, state of the art, phenolic prepreg.