

## Flame Retardancy of Organophosphorus Compound on Cellulose - an Eco Friendly Concern

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**Abstract :** Organophosphorus compound diethyloxymethyl-9-oxa-10-phosphaphenanthrene-10-oxide (DOPAC) was applied on cotton cellulose to impart eco-friendly flame retardant property to it. Here acetal linkage was introduced rather than conventionally used ester linkage to rescue from the undurability problem of flame retardant compound. Some acidic catalysts, sodium dihydrogen phosphate ( $\text{NaH}_2\text{PO}_4$ ), ammonium dihydrogen phosphate ( $\text{NH}_4\text{H}_2\text{PO}_4$ ) and phosphoric acid ( $\text{H}_3\text{PO}_4$ ) were successfully used to form acetal linkage between the base material and flame retardant compound. Inspiring limiting oxygen index (LOI) value of 22.4 was found after exclusive washing treatment. A good outcome of total heat of combustion (THC) 6.05 KJ/g was found possible during pyrolysis combustion flow calorimetry (PCFC) test of the treated sample. Low temperature dehydration with sufficient amount of char residue (14.89%) was experienced in case of treated sample. In addition, the temperature of peak heat release rate (TPHRR) 343.061°C supported the expected low temperature pyrolysis in condensed phase mechanism. With the consequence of pyrolysis effects, thermogravimetric analysis (TGA) also reported inspiring weight retention% of the treated samples.

**Keywords :** acetal linkage, char residue, cotton cellulose, flame retardant, loi, low temperature pyrolysis, organophosphorus, THC, THRR

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