

## Detection of Oxidation and Deterioration of Polypropylene (PP)

### by Chemiluminescence(CL) Assay

March, 2014

### Introduction

Polypropylenes (PP) are used in a variety of application such as packaging materials, textiles, stationery, automotive components. However, it is easily oxidized by heat or light, it must be stabilized with additives.

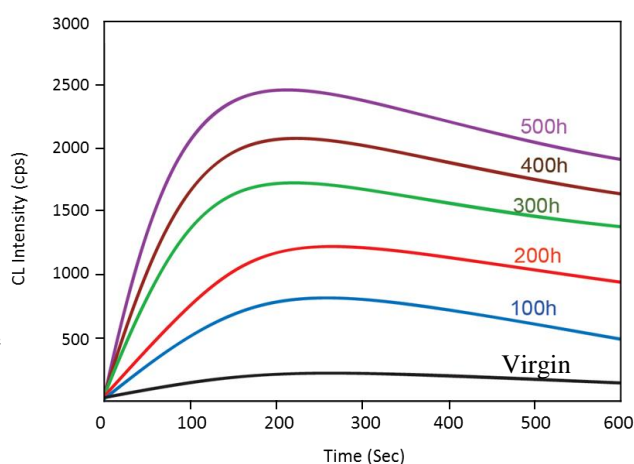
This report shows 1: Detection of oxidation level of PP and 2: Detection of oxidation stability of PP by chemiluminescence (CL) assay. The CL technique simply and rapidly detects oxidation levels and oxidation stabilities of polymers without any chemical reagents or delicate skills.

### Method and Results

#### 1: Detection of oxidation level of PP

PP was irradiated with xenon for 100, 200, 300, 400, 500 hours in order to proceed with oxidation. Time-course of CL of PP was measured by CLA-FC2 (CLA-FS4) at 100C for 10min (Fig.1). Results were compared to non-irradiated polypropylene. The CL increase depends on the oxidation time.

**System : CLD-ID3 (CLA-ID4) 、CLS-ST3**



*Fig.1 CL time-course change of oxidized PP*

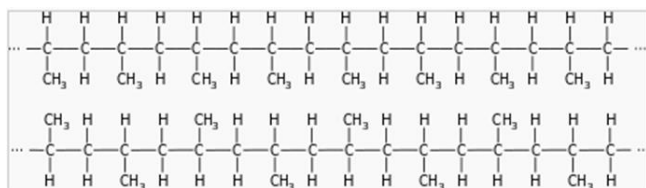
#### 2: Detection of oxidation stability of PP

As for PP, isotactic polypropylene (IPP) and syndiotactic polypropylene (SPP) are characterized by a stereoregular difference (Fig.2). It is known that IPP oxidizes easier than SPP because of this structure difference.

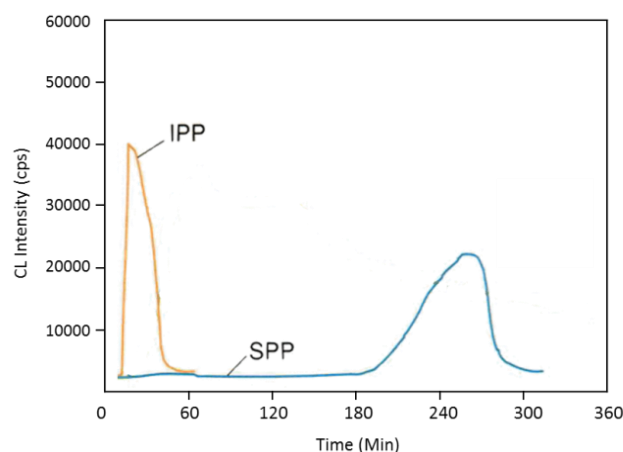
CL of IPP and SPP were measured at 150C under oxygen flow. CL drastically increases when auto-oxidation starts.

This point is the "Oxidation Induction Time (OIT)". OIT is a measure of the stability to oxidation. The OIT of IPP is much shorter than SPP (Fig.3). It demonstrates that IPP is easier to oxidize than SPP.

**System : CLD-ID3 (CLA-ID4) 、CLS-ST3**



*Fig.2 Upper: IPP, Lower: SPP*



*Fig.3 OIT of IPP and SPP*

Osawa, Z : Macromol. Rapid Commun...,18, 667-671, 1997