Effects of thermal ageing on HMS-PP crystallinity

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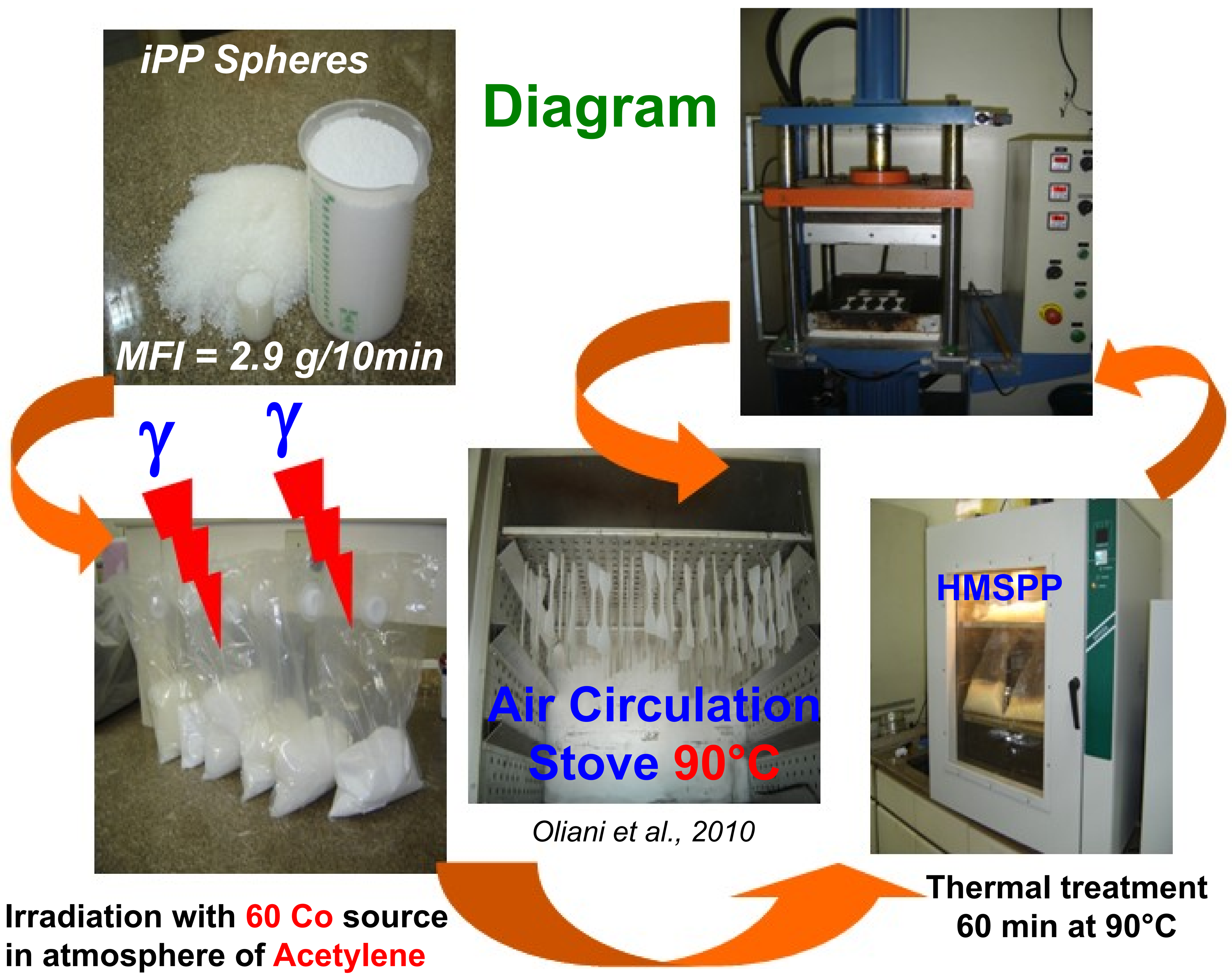
Objective - Study the effects of thermal ageing of high melt strength polypropylene (HMS-PP).

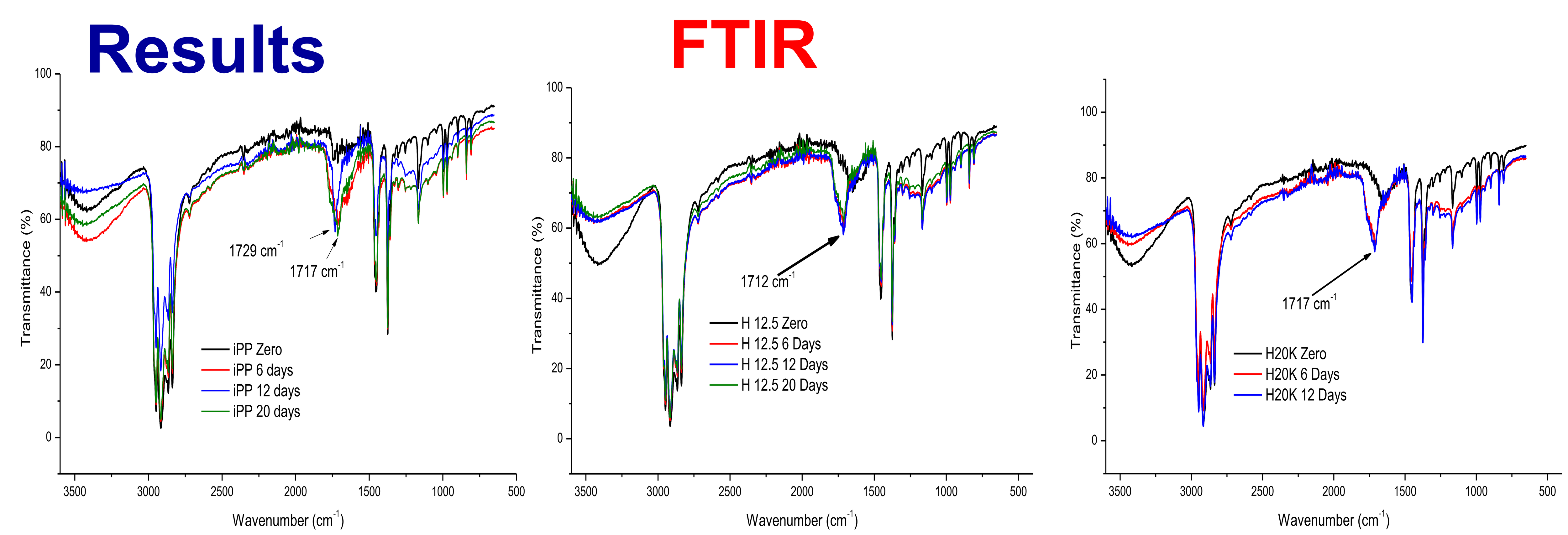


Introduction

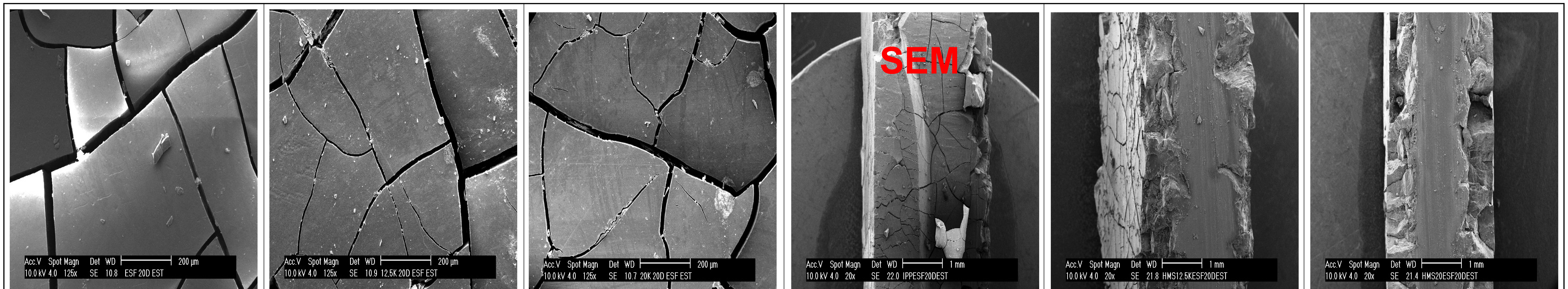
In thermal ageing of semicrystalline polymers, the mobility of molecular segments is increased by thermal activation even with no changes is operated in the molecular size. Contraction of the surface layers is a consequence of chemicrystallization and results in surface cracks, one of the reasons for embrittlement of ductile semicrystalline polymers (Pospisil et al., 2003). For the determination of the thermooxidative stability plastic materials, samples are usually subjected to accelerated ageing in an oven. To increase the effect of accelerated ageing in order to obtain faster estimatives of a possible lifetime, measurement of the thermooxidative stability at temperatures above the melting point of the polymer has been suggested (Zweifel, 1998).

Results

FTIR



SEM



iPP, 200µm, surface plane (times 20 days)	HMS-PP 12.5 kGy, 200µm, surface plane	HMS-PP 20 kGy, 200 µm, surface plane	iPP, 1 mm, transversal cut	HMS-PP 12.5 kGy, 1 mm, transversal cut	HMS-PP 20 kGy, 1mm, transversal cut

Conclusions-

The effects of thermal ageing on iPP and HMS-PP was mainly the intense crack formation. Chain scission and oxygen diffusion were more evident in the iPP. Surface cracks showed propagation that increases with the ageing time. The HMS-PP 12.5 kGy and HMS-PP 20 kGy samples have more resistance than iPP to O_2 permeation and crack propagations.

References

1 - Pospisil, Horak, Pilar, Billingham, Zweifel and Nespurek, 2003. Polym Degrad Stab., 82, 145-162.
2 - Zweifel, 1998. Stabilization of Polymeric Materials
3 - Oliani, Parra, Lugao, 2010. *Radiat Phys Chem.*, 79, 383-387.

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