**Polymer Technology**

Research efforts in polymer technology fall into three categories: The first and most important is control of material oxidation behaviour. The second is the control of permeation through- and controlled release of active ingredients from polymers. The third and newest research area involves heat stabilisation of PVC using modified layered double hydroxides.

**Controlled oxidation**

The ageing observed in polymers during their normal service life is a manifestation of slow oxidation by atmospheric oxygen. We have shown that LDH nanoparticles are effective light mediated pro-oxidants that can be used to control the life time of one-way packaging in order to reduce the visual impact of plastic litter. This technology was licensed to Evergreen Environmental.

**Slow oxidation of polymers: Controlling litter lifetime**

Walter W. Focke. Plastic film litter: Is there really a role for oxo-(bio)degradation? Journal of Vinyl and Additive Technology, **14** (2008) 153-154.

B. Magagula, N. Nhlapo and W.W. Focke. Mn2Al-LDH- and Co2Al-LDH-stearate as photo degradants for LDPE film. Polymer Degradation and Stability 94 (2009), pp. 947-954.

W.W. Focke and I. van der Westhuizen. Oxidation induction time (OIT) and oxidation onset temperature (OOT) of polyethylene in air. Testing Gimzewski's postulate. J Therm Anal Calorim (2010) 99:285–293 (DOI 10.1007/s10973-009-0097-1).

W.W. Focke, R.P. Mashele and N.S. Nhlapo. Stabilization of LDPE films containing metal stearates as photodegradants. Accepted by Journal of Vinyl and Additive Technology on 11 April 2010.

BD Magagula, NS Nhlapo and WW Focke, A degradable polymeric material, SA Patent 2010/00865. 18 January 2010.

**Fast oxidation in polymers and carbon and its control via flame retardants**

Labuschagné, FJWJ, and WW. Focke, Metal Catalysed Intumescence: Characterisation of the Thermal Decomposition of Calcium Gluconate Monohydrate, *J. Mat. Sci*. **38** (6) (2003) 1249-1254.

Labuschagné, FJWJ, SMC. Verryn and WW Focke, X-ray Powder Diffraction Data for Ammonium d-Gluconate, C6H11O-7NH4+, *Powder Diffr*., **18**(2), (2003) 162-164.

Mara Burns, Udo Wagenknecht, Berndt Kretzschmar and Walter W. Focke. Effect of hydrated fillers and red phosphorus on the limiting oxygen index (LOI) of EVA-PVB and LDPE-EVAL blends. Journal of Vinyl and Additive Technology, **14** (2008) 113-119.

Walter W Focke,Dan Molefe, FJW Labuschagne and Shatish Ramjee. The influence of stearic acid coating on the properties of magnesium hydroxide, hydromagnesite and hydrotalcite powders. J. Mat. Sci. 44 (2009) 6100-6109. DOI 10.1007/s10853-009-3844-6

Heinrich Badenhorst, Brian Rand and Walter W. Focke. Modelling of natural graphite oxidation using thermal analysis techniques. J Therm Anal Calorim (2010) 99:211–228 (DOI 10.1007/s10973-009-0095-3)

**Controlled permeability and controlled release of actives**

Here the objective is to prevent passage of a gas or water vapour through a polymer film or the controlled release of an active such as volatile corrosion inhibitor from a packaging film or an insecticide from the fibre of a bed net. This activity fits in with the malaria control project. Recent papers include:

Vuorinen, E, E Kálmánand WW Focke. Introduction to vapour phase corrosion inhibitors in metal packaging. *Surface Engineering*, **20** (4) (2004) 281-284.

Niel Pieterse, Walter W. Focke, Eino Vuorinen and Ilona Rácz (2006). “Estimating the Vapour Pressures of Volatile Corrosion Inhibitors from Isothermal Thermogravimetric Data”. *Corrosion Science*, **48** (8) 1986-1995.

WW Focke, A revised equation for estimating the vapour pressure of low-volatility substances from isothermal thermogravimetric data, *J. Therm. Anal. Cal.* 74 (2003) 1107-1118.

Pieterse, N and WW Focke, Diffusion controlled evaporation through a stagnant gas: Estimating low vapour pressures from thermogravimetric data, *Thermochimica Acta*., 406, 1-2 (2003) 191-198.

Moolman, F.S., Rolfes, H., Van der Merwe, S.W. and Focke, WW  (2004). Optimization of perfluorocarbon emulsion properties for enhancing mass transfer in a bio-artificial liver support system. *Biochem. Eng. J.***19**(3): 237-250.

Landman EP, Focke WW; Stearate intercalated layered double hydroxides: effect on the physical properties of dextrin-alginate films. *Journal of Materials Science*, **41** (8) (2006) 2271 – 2279.

Landman, EP and Focke, WW. Poly(vinyl sulfonate) intercalation into stearate intercalated layered double hydroxides. *SAJS* Vol. **102** (11/12) (2007) 581-584.

Suven Pecku, Thilo L. van der Merwe, Heidi Rolfes, Walter W. Focke, Starch as antiblocking agent in breathable polyurethane membranes, *Journal of Vinyl and Additive Technology*, **13** (4) (2007) 215-220.