



POLESTAR™ 200R IN THERMAL BARRIER FILM

POLESTAR™ 200R CALCINED CLAY AS AN INFRARED ABSORBER IN PLASTICS

A large market for polyethylene film exists in the agricultural and horticultural industries for products such as greenhouses and cloches. Unmodified polyethylene, however, is not completely suitable for these applications as it is almost transparent to infrared radiation. Heat generated under the film will escape through it when the source is removed (the heat being energy in the far infrared region of the spectrum with wavelengths between 8 and 25um.) Figure 1 shows the infrared spectrum of PoleStar™ 200R.

Consequently one of the best and most cost-effective ways of improving the thermal barrier properties of polyethylene film is to use low levels (up to 10% being common) of PoleStar™ 200R. Such a film has very broad absorption peaks in the far infrared region of the spectrum and at 8 wt% loading is more than 70% opaque to heat loss.

Although PoleStar™ 200R filled film has marked effects in the infrared, transmission of energy in the visible and ultra-violet regions is very good at 8% loading; light transmission is reduced by a uniform 10% when compared to the unfilled. Most of this reduction is due to the light-scattering effects of the sub-micron particles in the clay giving slightly opalescent films. This can be an added bonus, as it will give more uniform diffuse light transmission. PoleStar™ 200R is normally used at loadings of 3-10wt% with higher levels providing a greater thermal barrier. Physical properties of polyethylene with 8 wt loading (Table 1) show no significant difference from the unfilled polymer. If anything the filled polyethylene gives slightly higher strengths than the unfilled.

PoleStar™ 200R filled film has given no obvious problems in natural weathering. Accelerated testing (in a UV cabinet simulating conditions in the Paris Basin) has been carried out, and the changes in tensile strength and elongation at break which have occurred over a period equivalent to 3 years show no significant difference between filled and unfilled film.

TABLE 1: PHYSICAL PROPERTIES OF POLYETHYLENE, WITH AND WITHOUT POLESTAR 200R AT 8 WT%

	Unfilled	PoleStar™ 200R
Tensile Strength (MPa)	17.9	18.7
Elongation at break (%)	81.5	86.9
Tear Strength (N per 2mm sample)		
With flow	199.0	209.0
Across flow	188.0	202.0
Charpy notched impact (J)		
-30°C	0.42	0.50
-60°C	0.21	0.23

FIGURE 1: INFRARED SPECTRUM OF CALCINED CLAY

