

Secoia 1400: a polymer to produce water- and bio-based wall paints

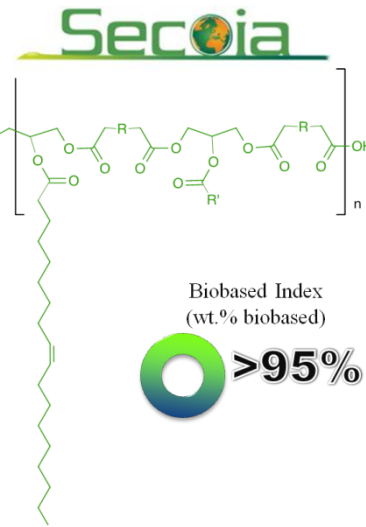


Figure 1: Secoia 1400 based on a 95% vegetable origin raw materials.

- Renewable and vegetable raw materials
- Low VOC (< 1 g/L) / Low odor
- Similar applied cost to Styrene Acrylic paints
- High quality (adhesion, scrub resistance...)

Waterborne coatings are the most common overall technology for architectural coatings and it continues to grow driven by VOC regulations and increased sustainable awareness around the world. Moreover B2B and B2C customers are more and more seeking reduced environmental footprint, biobased alternatives or energy saving products. In this context, alkyd technology is the big winner in water-based products and we will show hereafter how to make successful water-based bio-based wall paints with near zero VOC.

Binder characteristics

Ecoat, has developed the Secoia 1400, a water-based and 95%+ bio-based alkyd binder that can meet today's requirements of modern water-based paint (Table 1 - Figure 1).

Table 1: Externally emulsified alkyd emulsions.

Ref.	Oil length (%)	Biobased content (%)	Positioning and use
Secoia 1400	31	>95%	Low color biobased binder

Secoia 1400 is an externally emulsified coalescent free alkyd emulsion, where the alkyd resin is dispersed in water thanks to the addition of surfactants.

Paint formulation

Here below is a starting mate wall paint formulation based on customer feedbacks and Ecoat's experience (Figure 2). Semi-gloss starting paint formulations are also available on request.

Ingredients	Weight (g)	Weight (g)	Chemical function
<i>Prepare the millbase</i>			
Water	24,93	24,93	Water
Satiagel MM 40 SB GR	0,35	0,35	Carrageenan
Satiaxane CS 2 QD	0,15	0,15	Xanthan Gum
<i>Disperse at high speed during 15-20 minutes</i>			
Orotan 731 A ER	1,35	1,35	Dispersing agent
Byk 024	0,20	0,20	Defoamer
Acticide MBS	0,20	0,20	Biocide
Kronos 2360	11,00	11,00	Titanium dioxide
Durcal 2	14,30	14,30	Calcium carbonate
Durcal 5	14,30	14,30	Calcium carbonate
Finntalc M15	2,50	2,50	Talcum
<i>Disperse at high speed-check the millbase</i>			
<i>Premix</i>			
Water	10,64	8,11	Water
Secoia 1400 (SC=50%)	20,00	0,00	Alkyd Emulsion
Styrene acrylic (SC=49%)	0,00	20,41	Styrene acrylic emulsion
Dowanol DPnB	0,00	2,20	Coalescing agent
BorchiOxyCoat 1101	0,08	0,00	Iron based drier
<i>Mix 5mn, then add under agitation the millbase</i>			
Total	100,00	100,00	

Paint Characteristics:	
Theoretical values	
Density (g/cm ³)	1,41
Solids in weight (%)	53,1
Solids in volume (%)	33,8
Binder content (%)	10
PVC (%)	58,9
PVC/CPVC	0,94

Figure 2: Mate paint formulation based on Secoia 1400 and a styrene acrylic.

The application

General rules are that water-borne architectural paints require a temperature of at least 5°C and maximum 35°C, in order to allow a proper water evaporation and therefore to achieve a good film formation.

The relative humidity of the air has also a big impact on the application properties and the drying. The recommendation is that the relative humidity should be within the range of 20-70%.

Key results

Down below are the paint performances according to European mostly used standards.

Table 2: Paint performances of mate paint formulations.

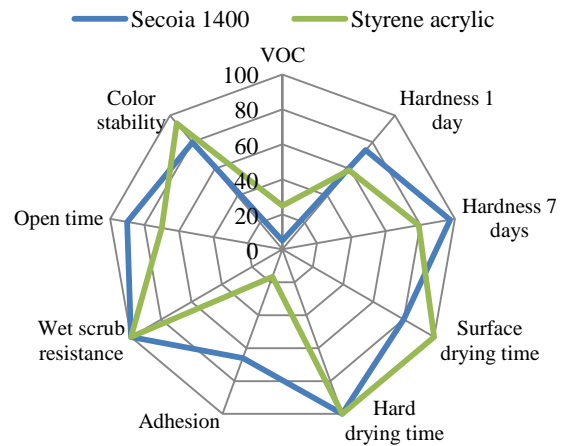
Item	Wet film thickness (µm)	Drying time	Secoia 1400	Styrene acrylic
Gloss 60°	200±10	168h	2,3	2,2
Surface Drying Time (h) Touch Dry	200±10	—	<1h	<1h
Hard Drying Time (h) (Cotton ball method)	200±10	—	<1h	<1h
Persoz Hardness after 24h	100±5	24h	134	107
Persoz Hardness after 168h	100±5	168h	176	143
Adhesion on plasterboard - Cross Cut Test	200±10	24h	2	5
Wet scrub resistance after 4 weeks	200±10	28 days	Class 1	Class 1
Resistance to yellowing after 42 days in dark (Δb*)	128±5	42 days	0,777	0,163
Open time of semi-gloss paint (min)	—	—	9-10	7-8



Figure 3: Mate paints after wet scrub resistance test.



Figure 4: Cross cut test adhesion on plasterboard of Secoia 1400 and a styrene acrylic.



Styrene acrylic binders stand as a benchmark for architectural coatings, because of their overall good balance between price and performances.

However paints based on Secoia 1400 are clearly an alternative of choice especially regarding the VOC, adhesion (Figure 4), open time and hardness.

Economical data

Down below is a comparison of paint formulation cost between Ecoat's alkyd emulsions and other technologies (Table 3).

Table 3: Economical comparison.

Chemistry	Alkyd emulsion	Styrene acrylic
Expected coverage yield (m ² /L)	12	10
Formulation additives	0,08wt.% Drier	2-5wt.% Co-solvent / Coalescing agent
Cost impact on formulation	+0,07 €/kg of paint	
Applied cost impact	-0,01€/m ² of wall painted	

Even though the styrene acrylic technology might seem cheaper than water-based alkyds, when considering the petrobased raw materials price, **the paint formulations are somehow cost competitive.** Because of their high T_g, acrylic binders require the addition of costly additives such as coalescing agent, plasticizer, or co-solvent. Moreover the coverage per unit of latex paint is lower than that of alkyd paints, making the latter even more competitive.