Colloidal silica in deco paints

Study explores the efficacy of Levasil CC301 to extend the open time of water-based paint

The results presented here are a summary of the study "Use of surface modified colloidal silica as open time extender in white deco paints" conducted by Céline de Lame, Jean-Marie Claeys and Xavier Godeauz at CoRI, Belgium, in co-operation with Nouryon.

Improved paint properties

Silane modified colloidal silica, Levasil CC301, is an efficient open time extender in waterborne coating systems. However, its efficiency strongly depends on the paint composition, and more specifically the thickening agent that is used.

Product properties

Levasil CC301 is a unique water-based epoxy silane modified colloidal silica dispersion.

Specific parameter	Unit measure	Levasil CC301
SiO_2	wt%	30
pH		8
Density	g/cm^3	1.2
Viscosity	mPas	5
Average particle size	nm	7

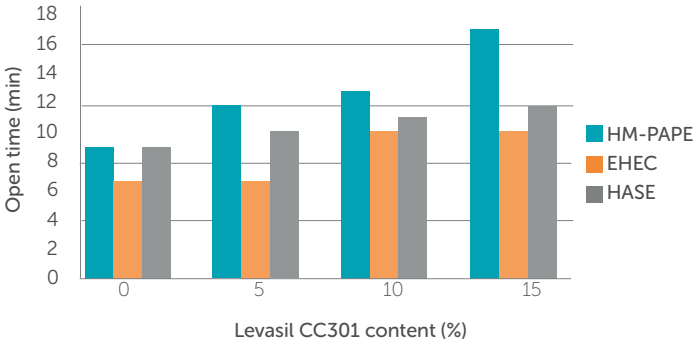
Studied paints

The coating systems studied are pigmented water-based paint differing by their thickening agent and colloidal silica content. Viscosity and solid content were kept constant at the level of the reference systems, even after addition of Levasil CC301.

Thickeners studied:
HM-PAPE
EHEC
HASE

Open time

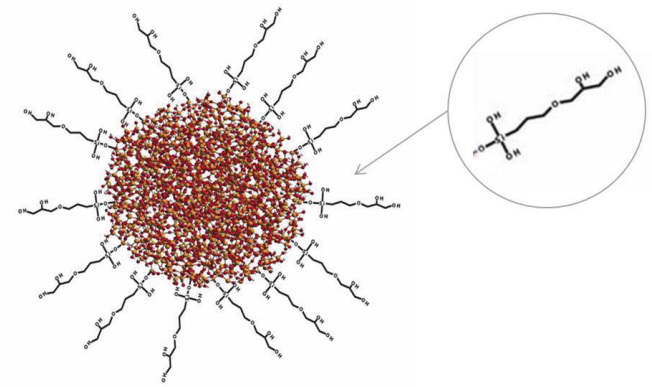
The type of thickener used affects the open time of a paint. The addition of silane modified colloidal silica, Levasil CC301, induces an extension of the open time for all studied thickeners but the degree of extension varies between the thickening agents. Levasil CC301 and HM-PAPE thickener in combination give best results; an extension of open time with up to 89%. Similar results are obtained for clear coat systems. Open time was determined according to ASTM D7488 standard.



Rheological properties

It is rheological properties such as yield stress and elasticity, which differ between thickener types, that affect the efficiency of Levasil CC301 as an open time extender. In systems characterized by high yield stress and elasticity, the colloidal silica particles are hindered or slowed in their migration to the paint surface and then give a smaller extension of open time.

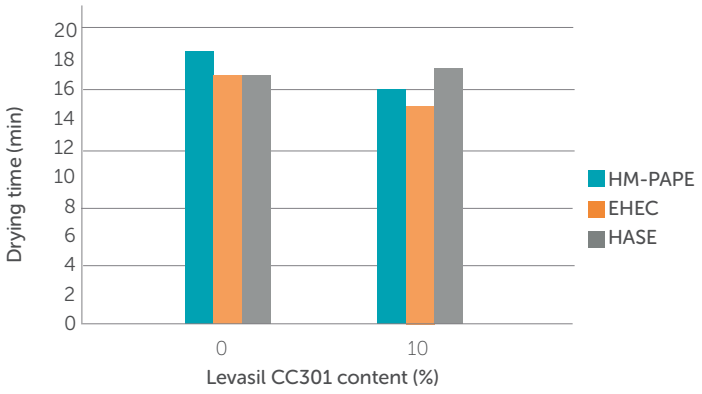
Levasil CC301, model structure



Drying time

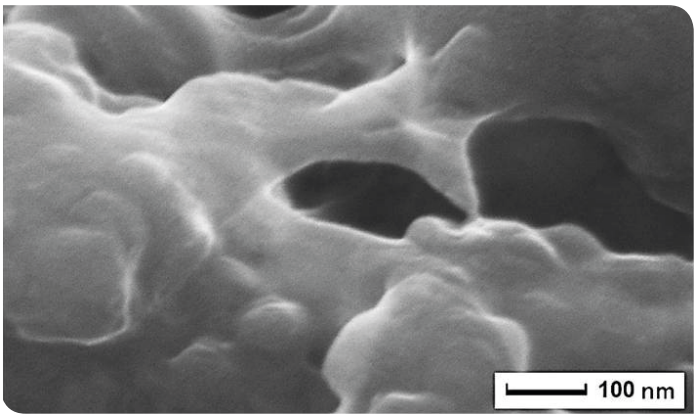
In addition to open time, the drying time of paint is also slightly affected by the type of thickener used. HM-PAPE and EHEC based systems are characterized by shorter drying times (2–3 min) in the presence of 10% Levasil CC301.

Drying time was determined according to ASTM D5895 standard

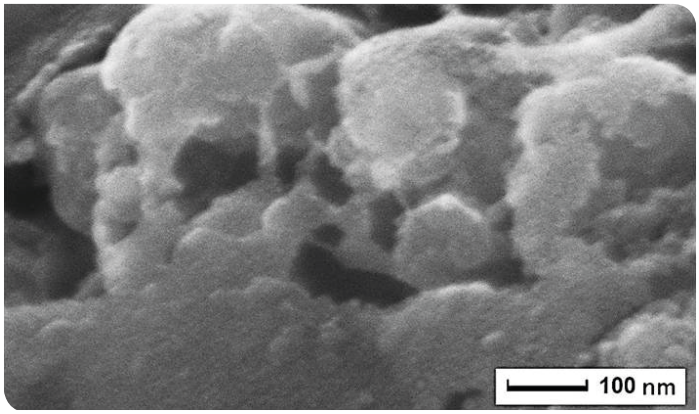


SEM analysis

Surface enrichment of colloidal silica on the paint surface is likely the cause of surface hardening and the modification of properties such as open time, hardness development and dirt pick-up resistance.



Paint surface



Paint surface with Levasil CC301.

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Nouryon

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