



## HIGH PERFORMANCE ANCAMINE® 2719 for more sustainable fast cure coating applications

Following the current industry trends, the metal coatings market is looking into adopting more environmentally and user-friendly epoxy primers to enhance performance and improve productivity, while also meeting sustainability targets. To meet these growing requirements and to give more ecological protective coatings and industrial applications the same high performance as traditional primers, Evonik recommends, ANCAMINE® 2719.

In addition to the excellent corrosion resistance typical for epoxy resins, this hardener gives exceptionally high chemical resistance and is suitable for potable water and food applications as all its raw materials are listed on the EU Directive 10/2011.

Based on standard liquid bisphenol A diglycidyl ether resins, ANCAMINE® 2719 offers fast property development at ambient and lower temperatures. Unlike other fast cure amine hardeners, ANCAMINE® 2719 contains no alkyl-phenols, such as nonyl-phenol or para-tertiary-butyl phenols which leads to a significantly improved EHS profile. Furthermore, 43% of its raw materials are derived from biobased renewable sources which adds an important sustainable feature to this curing agent. Additionally, the low viscosity of around 300-500 mPa.s further supports the environmental benefits as it enables the formulation of high solid systems using only very low amounts of solvents or plasticizers protecting the environment and workers.

The amine value is in the range of 340-380 mg KOH/g, so a use level of 40 parts of ANCAMINE® 2719 (AHEW=75) cured with 100 parts of bisphenol A diglycidyl ether (EEW=190) is recommended. Other resin types might also be used to enhance chemical resistance or promote other properties.

For a performance comparison, ANCAMINE® 2719 is compared to two examples of Evonik's other fast hardeners below, ANCAMINE® 2609W and ANCAMINE® 2432.

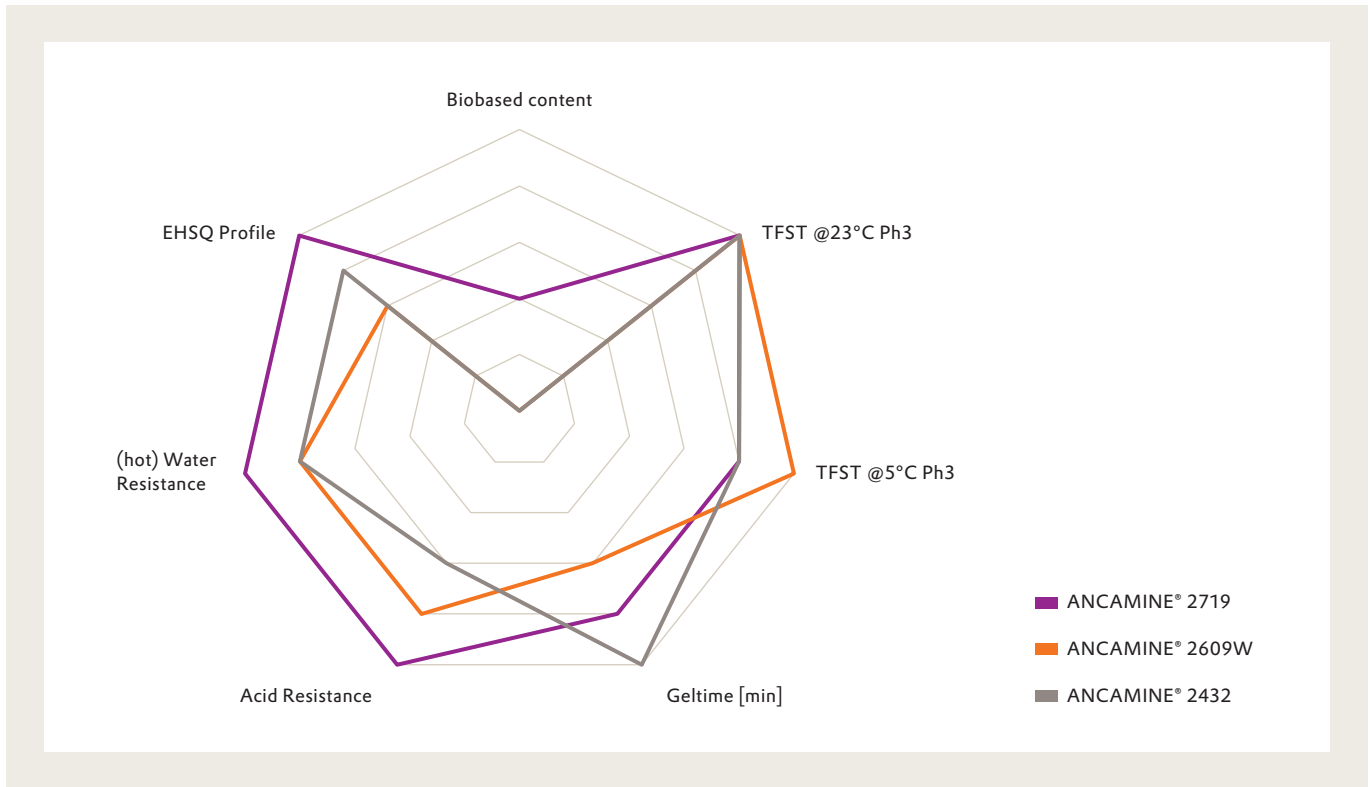
With BADGE (EEW=190)	Unit	Ancamine® 2719	Ancamine® 2609W	Ancamine® 2432
<b>Biobased Ingredients</b>	%	≈ 43	0	0
<b>Viscosity @25°C</b>	mPa.s	300–500	300–600	200–400
<b>Color</b>	Gardner	14	5	4
<b>Equivalent</b>	Wt/{H}	75	75	88
<b>Recommended Use Level</b>	PHR	40	40	46
<b>Mix Viscosity @25°C</b>	mPa.s	2400	3100	2100
<b>Geltime</b>	min	20	15	27
<b>TFST @23°C Ph3</b>	h	2.5	2 (25°C)	2 (25°C)
<b>TFST @5°C Ph3</b>	h	8	7	8
<b>Carbamation Resistance @23°C 24h curing 1h/24h</b>	1–5 (5=best)	4/4	4/4	–
<b>Hot water Immersion Resistance @60°C 28d</b>	Weigth change %	1.7	1.9	–
<b>Shore D @25°C 24h curing</b>		80	80	81

Thin film set time (TFST) of ANCAMINE® 2719 curing agent with BADGE resin (EEW=190) in a 75µm film determined by BK drying recorder is 2.5 hours at 23°C, and 8 hours at 5°C. ANCAMINE® 2609W shows similar results in cure speed with 2 hours at 23°C and slightly shorter with 7 hours at 5°C. However, ANCAMINE® 2719 shows clear advantages over ANCAMINE® 2609W when it comes to labelling. Additionally, its fast property development also allows it to be used as an accelerator for other curing agents. The measured gel time in 150g mass measured at 25°C is very fast within 20 minutes, and the extended

pot life compared to ANCAMINE® 2609W (which only exhibits 15 minutes gel time) is another benefit when it comes to its handling properties. As expected ANCAMINE® 2432 is slower with 27 minutes gel time.

The high amount of biobased ingredients used in ANCAMINE® 2719 does lead to a dark brown color (Gardner 14) which is significantly above that of ANCAMINE® 2609W and ANCAMINE® 2432. However, since the preferred use for this curing agent is in metal primers this should not create a negative or noticeable effect in the end application.

The waterspot resistance of ANCAMINE® 2719 was also investigated when used at stoichiometric loading with BADGE (EEW=190) resin. A 150µm film was applied and cured for 1 day at 23°C and 5°C. A cotton ball saturated with water was placed on the film following both 1 hour and 24 hours exposure. After each period the film was examined for carbamation which can be detected by white spots of the respective salt, but ANCAMINE® 2719 was shown to offer excellent resistance with a rating of 4 (5= Best).

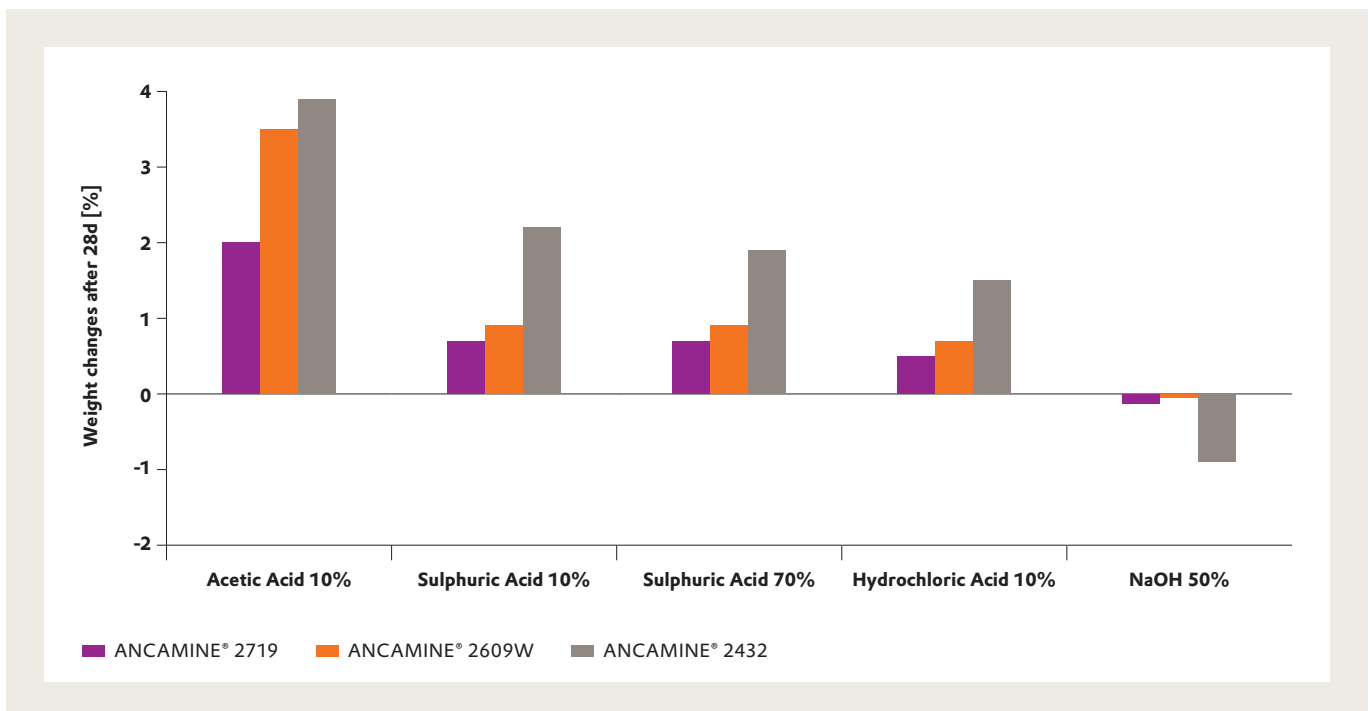


Additional studies showed that coatings based on ANCAMINE® 2719 cured with liquid epoxy resin exhibit high chemical resistance, especially against acids and hot water.

These chemical immersion studies were conducted in accordance with ASTM

D542 using ANCAMINE® 2719, ANCAMINE® 2609W and ANCAMINE® 2432 cured for 7 days at 23°C with BADGE (EEW=190). The chemical resistance is reported as the average weight change at different temperatures as a function of time up to 28 days. Excellent stability in both mineral

acids (10% hydrochloric acid as well as 10% and 70% sulfuric acid) and organic acid (10% acetic acid) could be confirmed which is further improved vs. ANCAMINE® 2719 and ANCAMINE® 2609W.

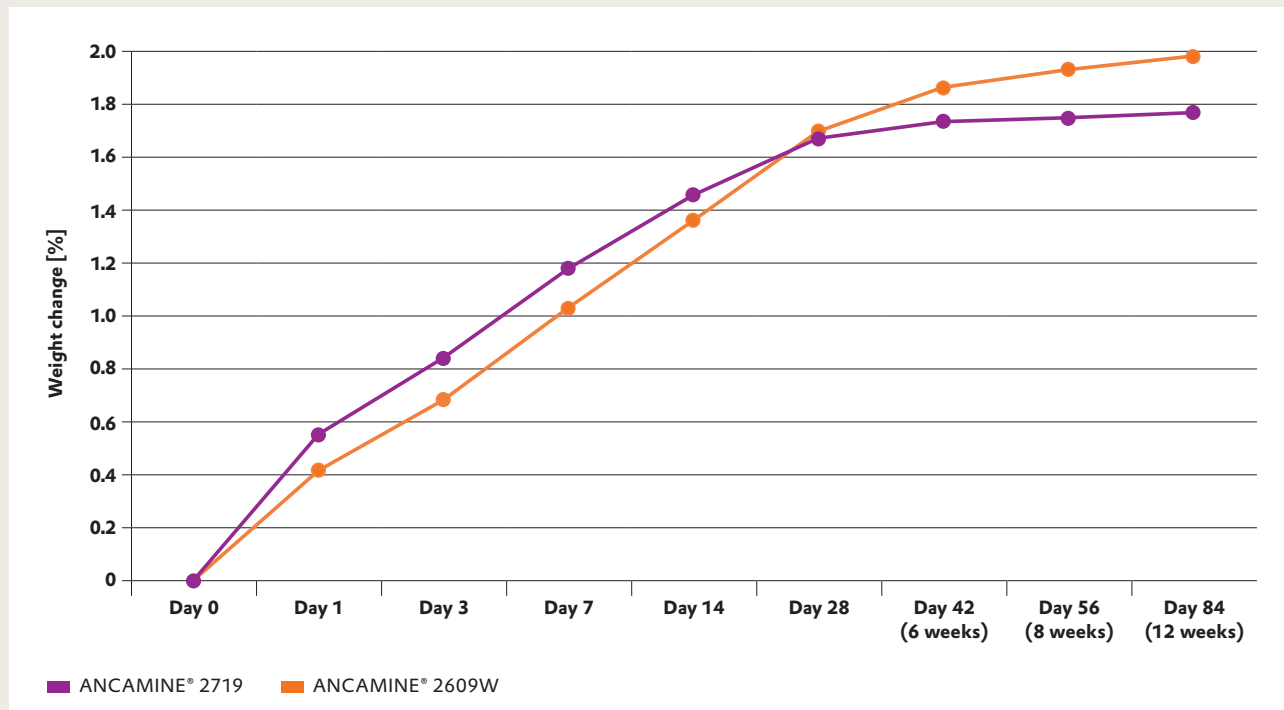


In addition, immersion in hot water tests at 60°C were performed over 12 weeks. The results demonstrate

an excellent weight change of just 1.7% in hot water resistance which is better than ANCAMINE® 2609W, well-known

for its strong water resistance properties.

### Hot water Immersion



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