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Beautiful moment, do not pass away! : how to extend the life of decorative exterior coatings

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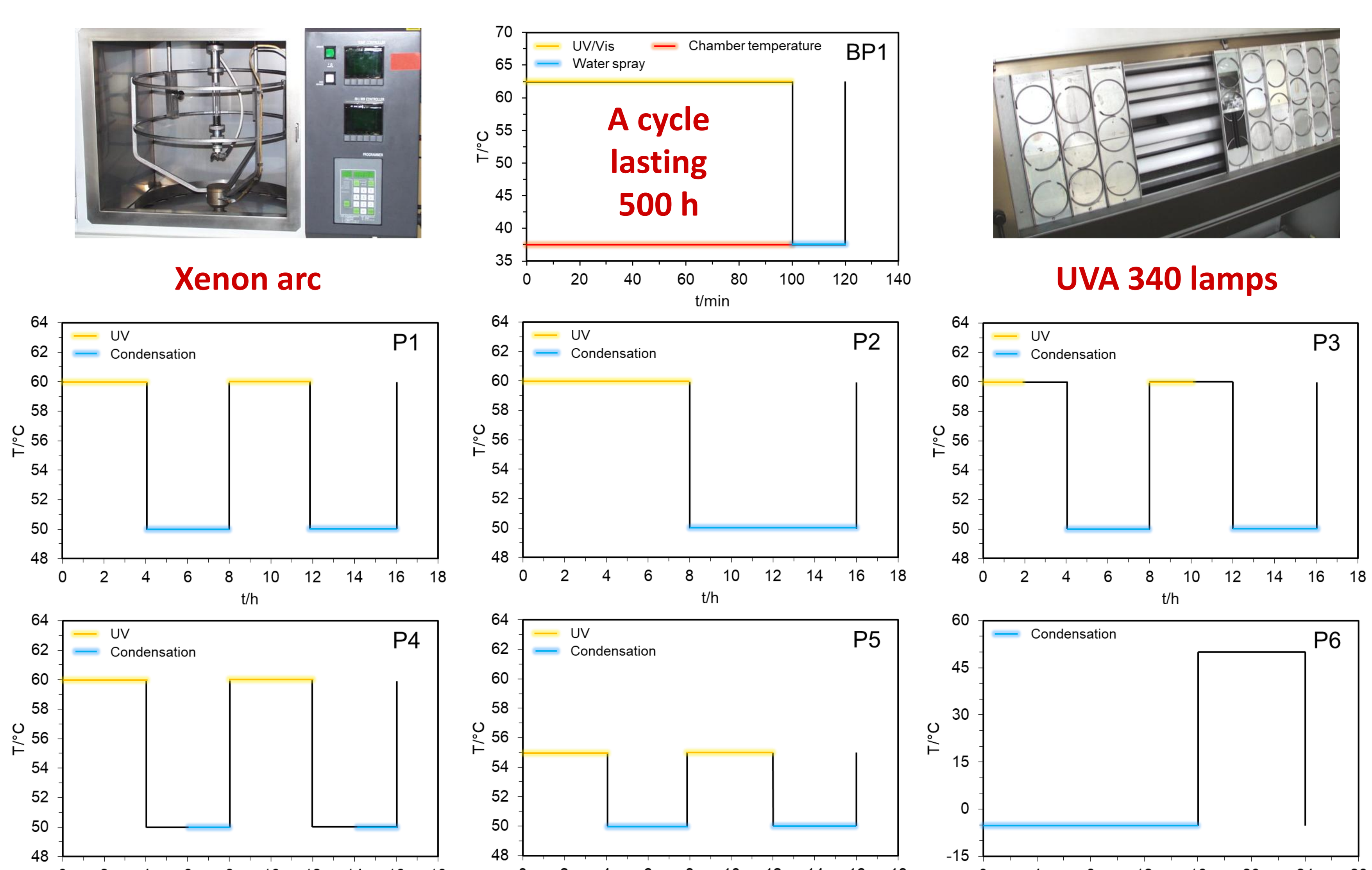
INTRODUCTION & AIM

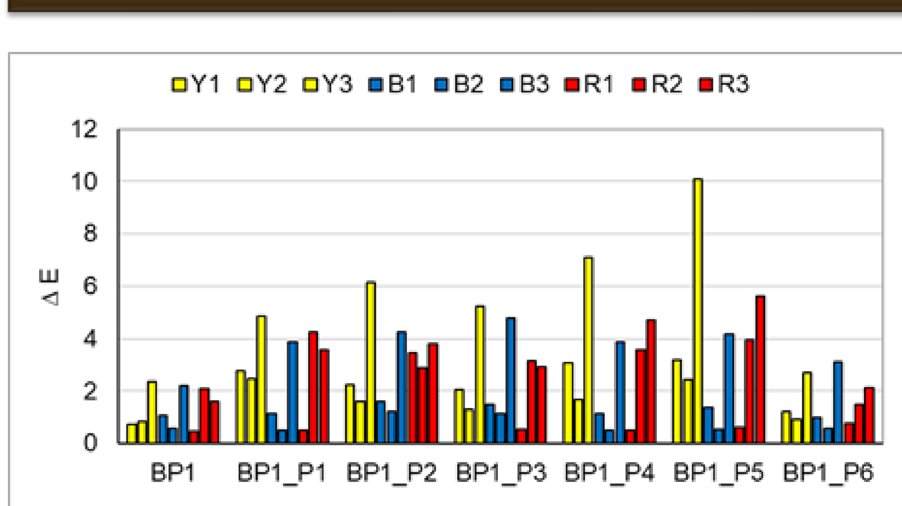
Can ensuring the longevity of decorative exterior coatings be as difficult a task as Goethe wrote *Faust*? The answer is probably not. Fortunately, more and more advanced auxiliaries and binders come to our aid. Moreover, the durability of coatings is significantly influenced by the pigments themselves and their compositions used during formulation. **The key assumption of this project is to assess the probability of selecting raw materials and modifying topcoats subjected to aging tests under cyclically changing conditions (temperature, humidity and radiation) in order to maximally extend their usability, by maintaining, among others, colour and gloss**

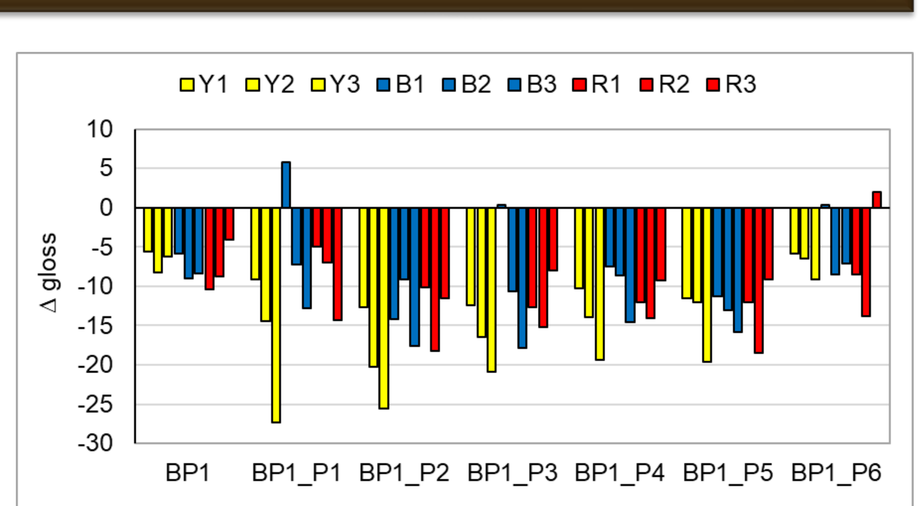
METHOD

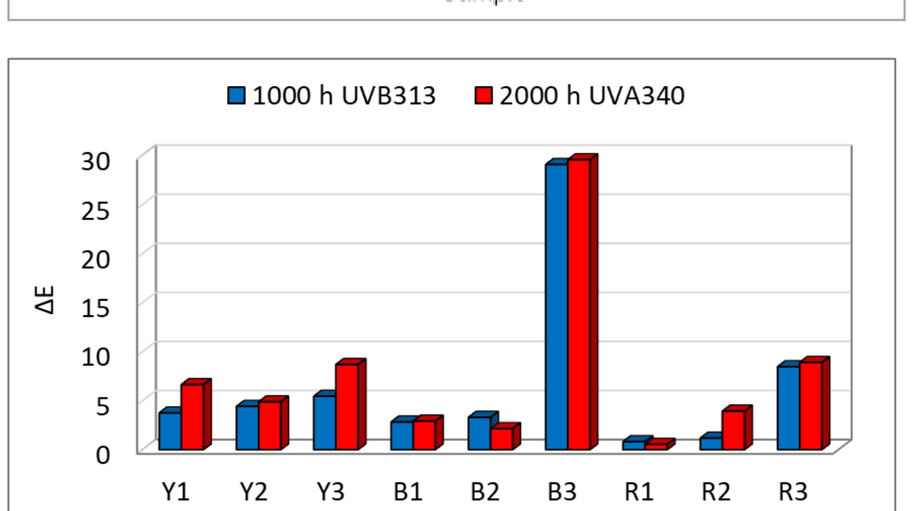
Colour compositions based on two **polyurethane binders** dedicated to topcoats and pigments in shades of **yellow**, **red** and **blue** were tested. The change in **colour, gloss, water contact angles, chemical structure (FTIR) and morphology (SEM)** of coatings placed in **climatic chambers** and exposed to **xenon lamps** and/or **UV** were determined



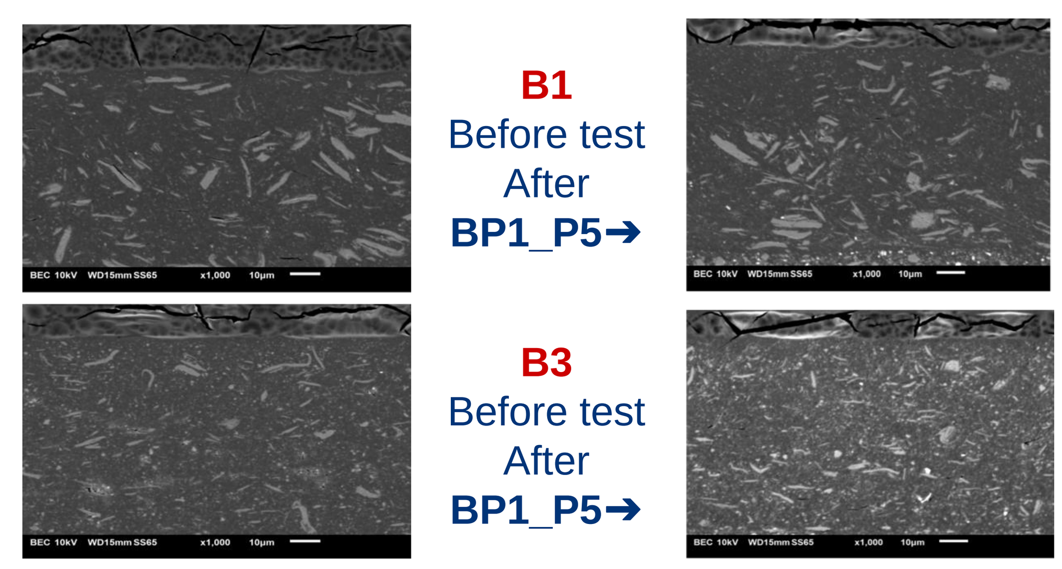
RESULTS & DISCUSSION



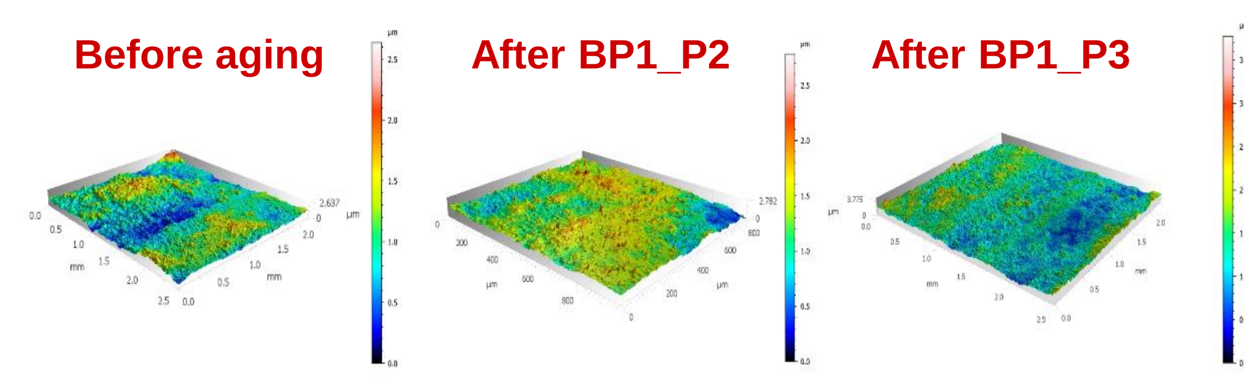


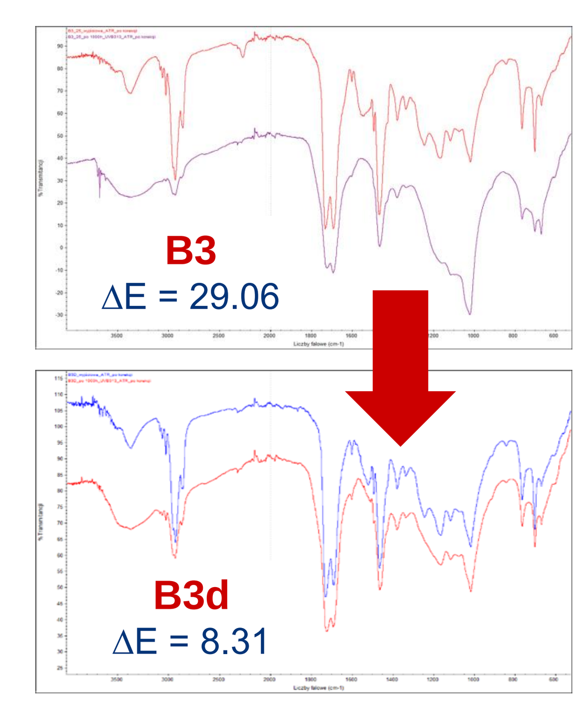


The most significant changes in colour and gloss were observed for samples from series 3 and 2. Both colour and gloss changed to a lesser extent in chamber with a xenon arc and in a chamber with variable humidity and temperature without UV exposure than in chamber with UV lamps

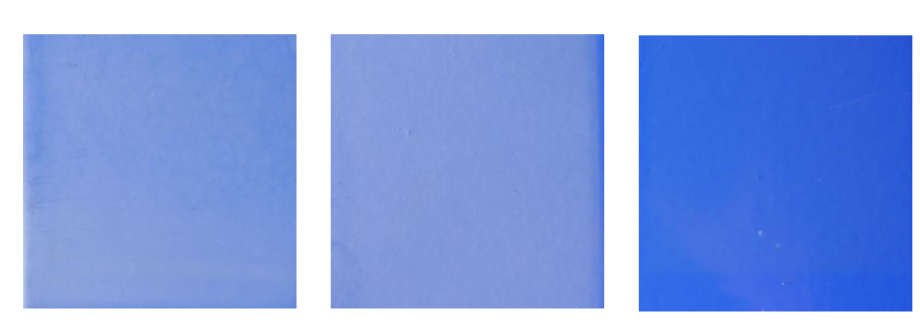


The addition of a **hydrophobic agent significantly increases the contact angle** – the higher the share of the additive, the better the hydrophobic properties. It can be seen also that **increasing the hydrophobicity of coatings improves their resistance to UV**





Exposure of coatings to **UV** and **moisture did not significantly change the surface structure and profile**, even in the case of pigment **B3**, for which significant changes in decorative properties were found



hydrophobic add. **(B3a)** ΔE = 21,95	wetting add. **(B3c)** ΔE = 26,19	UV/HALS add. **(B3d)** ΔE = 8,31

Increasing the amount of pigment **wetting agent** does not improve the hydrophobic properties of coatings but has a **positive effect on improving resistance to UV**

Binder	Pigment	Marking
2K PU resin (acryl)	Monoazo	Y1
	Monoazo Benzimidazolone	Y2
	Quinophthalone	Y3
	Cu-phthalocyanine	B1
	Indanthrone	B2
	Ultramarine	B3
	Diketopyrrolopyrrole	R1
	Monoazo	R2
	Monoazo	R3

Sample	Modification	ΔE
B3	–	29.06
B3a	3% hydrophobic additive	21.95
B3b	6% hydrophobic additive	29.49
B3c	more pigment wetting additive	26.19
B3d	absorber/stabilizer UV (2:1)	8.31
R3	–	8.45
R3a	absorber/stabilizer UV (2:1)	4.50
R3b	absorber/stabilizer UV (1:1)	5.12
R3c	6% hydrophobic additive	9.06
Y3	–	5.44
Y3a	3% hydrophobic additive	3.92
Y3b	6% hydrophobic additive	7.84
Y3c	more pigment wetting additive	3.18
Y3d	absorber/stabilizer UV (2:1)	3.04

CONCLUSION

It was shown that the factor with the **greatest influence** on the change in the performance parameters of coatings is **UV radiation**. The preservation of the decorative values of coatings also depended on the **qualitative composition** of the pigments used in each colour groups. Changes in **humidity** and **temperature had a slightly smaller effect**. Based on the obtained results, cycles with a full spectrum of impact on the **coatings were selected and ranked, from those causing the least degree of degradation to those showing the most negative impact on the usability of the coatings**

ACKNOWLEDGMENTS

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