

Influence of Vinyl acetate/ethylene Copolymer Powder on Secondary Efflorescence in Portland Cement-based Decorative Mortar

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□ Test of alkalis leachability

As shown in Fig.1, the upper surface of the cylinder specimen was exposed to de-ionized water (20 mL) with other surfaces sealed off. After immersion for 4 h, the water was completely collected and dried at $(70 \pm 2)^\circ \text{C}$. Then the weight of the residue after being dried was used to calculate the alkalis leachability as follows (Ebrahim, 2012):

$$L_{a,s} = m / (A \cdot t)$$

$L_{a,s}$ is the alkalis leachability, $\text{g}/(\text{m}^2 \cdot \text{h})$;

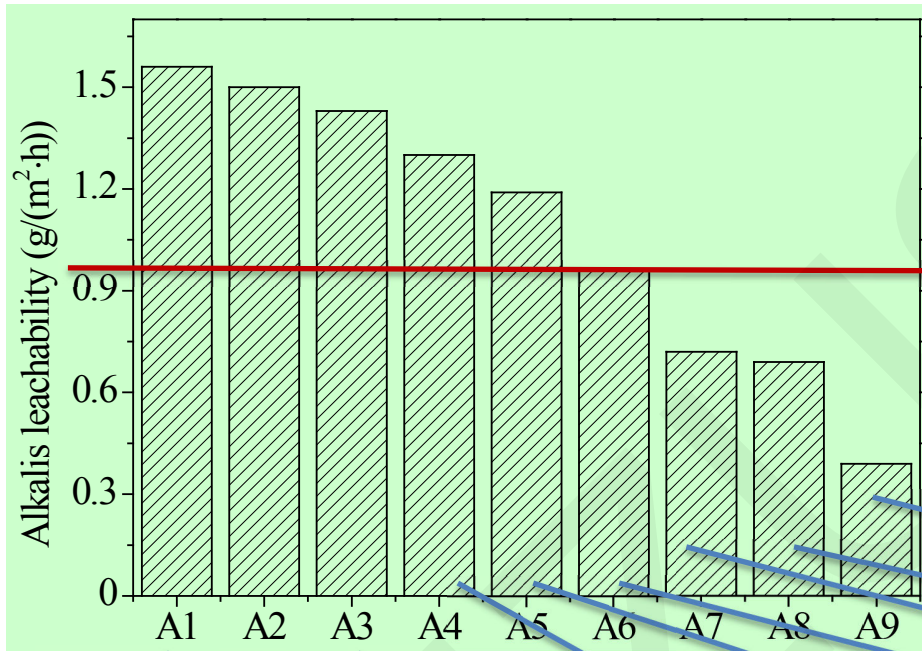
m is the weight of the residue in water, g;

A is the immersion surface area of the specimens, m^2 ;

t is the immersion time, h.

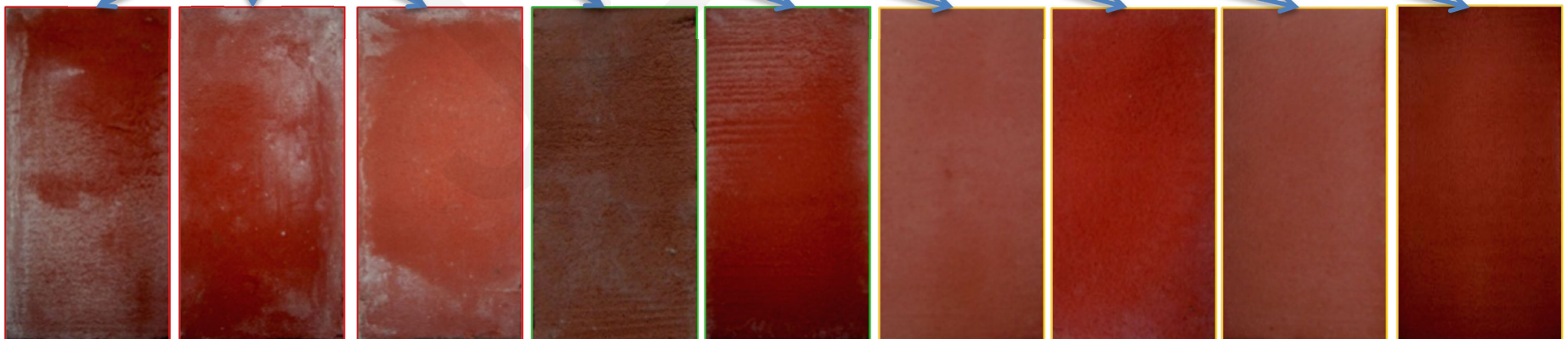


□ Relationship between secondary efflorescence and alkalis leachability



The alkalis leachability can be used to quantitatively evaluate the secondary efflorescence levels of PCDMs, with higher alkalis leachability value indicating a stronger secondary efflorescence trend.

With the alkalis leachability higher than 1 g/(m²·h), PCDMs will display visible secondary efflorescence.



Effect of VAE on secondary efflorescence

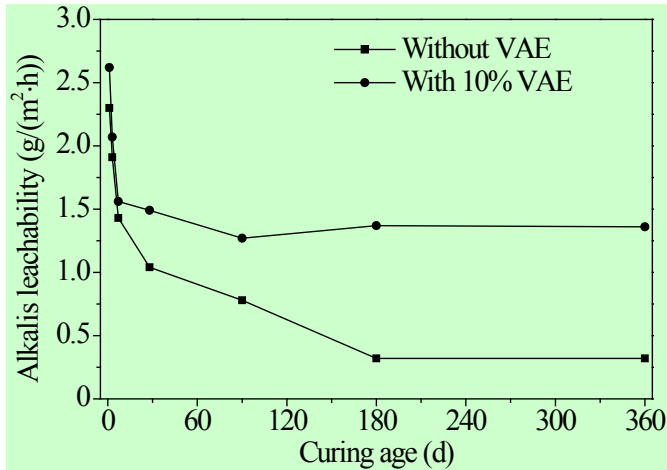


Fig. 5 The alkalis leachability of PCDMs

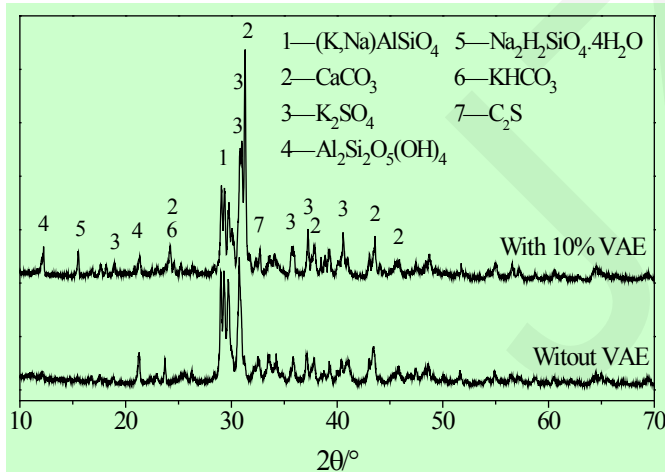


Fig. 6 XRD spectra of efflorescence substances

VAE promotes the secondary efflorescence of PCDM

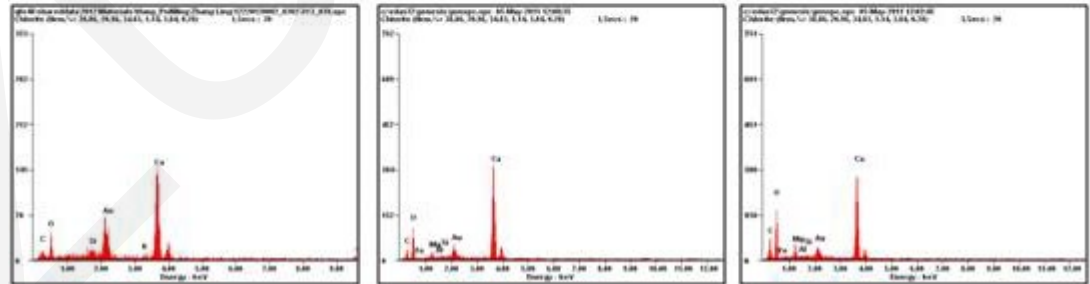
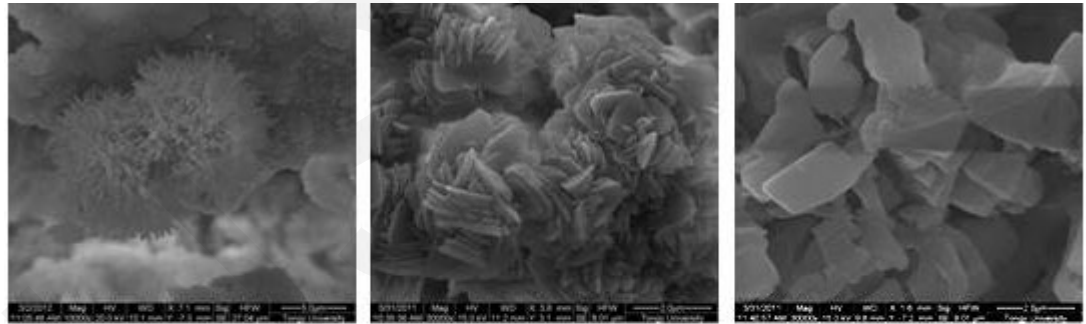
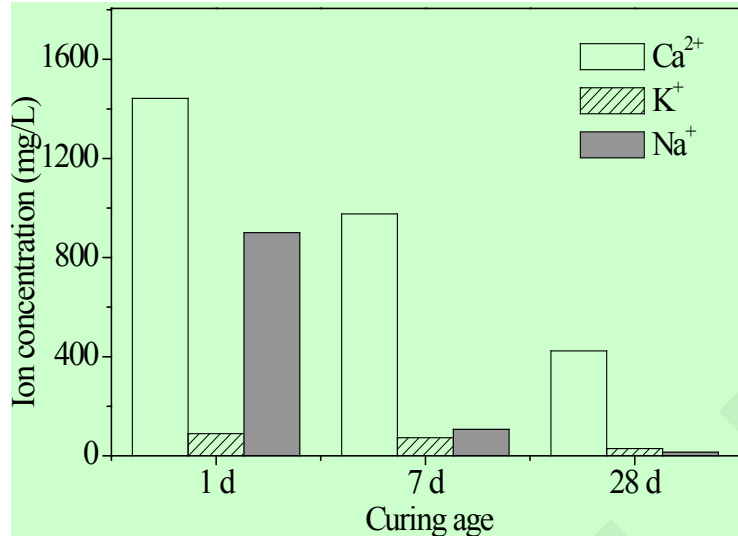


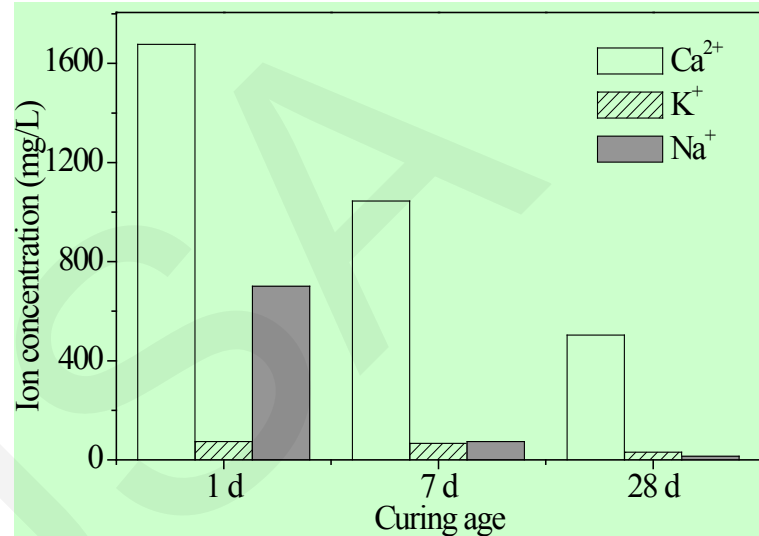
Fig. 8 Morphology and EDS analysis of secondary efflorescence particles

Alkalis ions including Ca^{2+} , K^+ and Na^+ are the main sources inducing secondary efflorescence for PCDM without or with VAE.

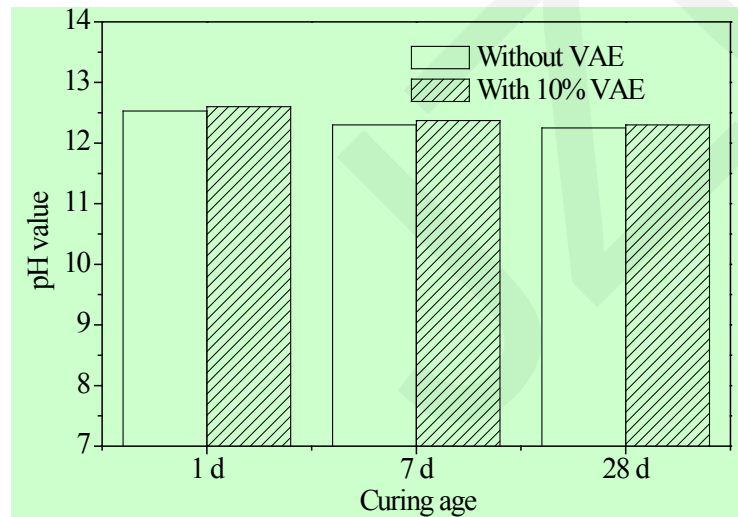
□ Content of soluble components inside PCDMs



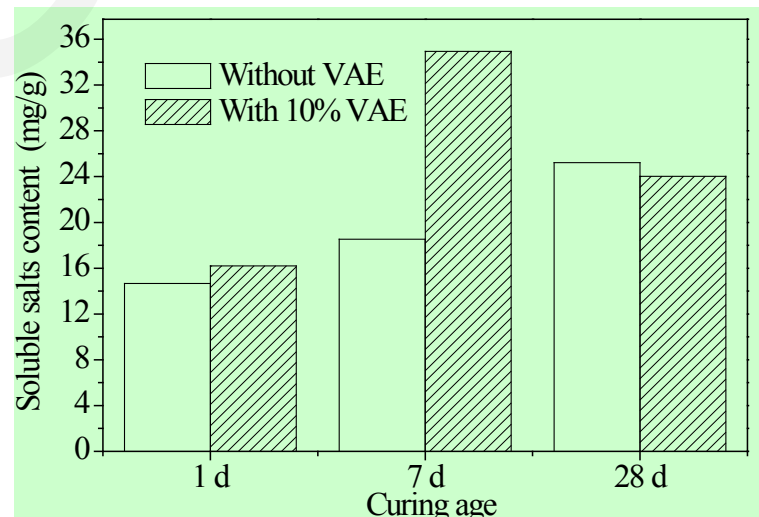
(a) Ions concentration in PCDM without VAE



(b) Ions concentration in PCDM with 10% VAE



(c) pH value



(d) content of soluble salts

□ Results and conclusions

- The alkalis leachability can be used to quantitatively evaluate the secondary efflorescence levels of PCDMs, with higher alkalis leachability value indicating a stronger secondary efflorescence trend. With the alkalis leachability higher than $1 \text{ g}/(\text{m}^2 \cdot \text{h})$, PCDMs will display visible secondary efflorescence.
- Alkalis ions including Ca^{2+} , K^+ and Na^+ are the main sources inducing secondary efflorescence for PCDM without or with VAE.
- VAE increases the total contents of the Ca^{2+} , K^+ and Na^+ ions inside PCDM, promotes their mobility to the surface, improves the ability of pore water transmitting ions; and accordingly increases the alkalis leachability, and promotes the secondary efflorescence of PCDM.