Effect of Metakaolin on the Drying Shrinkage Behaviour of Portland Cement Pastes

Duyou Lu, Jingwang Luo and Zhongzi Xu

Abstract In order to explore the mechanism of the effect of the metakaolin (MK) on the drying shrinkage of cementitious materials, the drying shrinkage and mass loss of Portland cement pastes with various MK contents (0, 5 %, 10 %, 15 %) and different maturities (pre-cured in water for 3 d and 28 d, respectively), were investigated by drying at 20 °C and 55 % relative humidity. The composition and microstructure of cement pastes were determined by thermal analysis and mercury intrusion porosimetry. Results show that the effect of MK on the drying shrinkage of cement pastes is closely related to the MK content and maturity of the pastes. The late-age drying shrinkage of cement pastes with different maturities decreased with the increase of MK contents. However, the effect on the early age drying shrinkage depended on the maturity of paste. The MK increased slightly the early age drying shrinkage of the paste pre-cured for 3 d, and decreased the early age shrinkage of the paste pre-cured for 28 d. The drying shrinkage of cement paste was proportional to its mass loss and the mechanism of water loss and its relation with the drying shrinkage varied. The decrease of drying shrinkage of blended cement paste with the MK was due to the result of less and slower evaporation of water in the MK blended cement paste with low porosity and refined pores structure by the micro-filler effect, nuclear effect and/or pozzolanic reaction of the MK.

D. Lu (✉) · J. Luo · Z. Xu
College of Materials Science and Engineering, Nanjing Tech University, 210009 Nanjing, China
e-mail: duyoulu@njtech.edu.cn

K. Scrivener and A. Favier (eds.), *Calcined Clays for Sustainable Concrete*, RILEM Bookseries 10, DOI 10.1007/978-94-017-9939-3_72