

Investigation of Long-Term Thermal Insulation Performance of Vacuum Insulation Panels with Various Enveloping Methods

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Abstract : To practically apply vacuum insulation panels (VIPs) to buildings or home appliances, VIPs have demanded long-term lifespan with outstanding insulation performance. Service lives of VIPs enveloped with Al-foil and three-layer Al-metallized envelope are calculated. For Al-foil envelope, the service life is longer but edge conduction is too large compared with the Al metallized envelope. To increase service life even more, the proposed double enveloping method and metal-barrier-added enveloping method are further analyzed. The service lives of the VIP to employ two enveloping methods are calculated. Also, pressure increase and thermal insulation performance characteristics are investigated. For the metal-barrier-added enveloping method, effective thermal conductivity increase with time is close to that of Al-foil envelope, especially, for getter-inserted VIPs. For the double enveloping method, if water vapor is perfectly adsorbed, the effect of service life enhancement becomes much greater. From these methods, the VIP can be guaranteed for the service life of more than 20 years.

Keywords : vacuum insulation panels, service life, double enveloping, metal-barrier-added enveloping, edge conduction

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