EXTRUDED POLYSTYRENE FOAM ASSOCIATION

1280 National Press Building
529 14th Street NW
Washington, DC 20045
Phone: (202) 591-2466
Fax: (202) 591-2445
Website: www.xpsa.com

MOISTURE ABSORPTION OF POLYSTYRENE FOAM INSULATIONS IS THE FOCUS OF THREE NEW "TECHNICAL INSIGHTS" FROM XPSA

Fundamental Knowledge of Polystyrene Structure Is Essential to Exercise Engineering Judgment in Specifying Foam Insulation in Applications Involving Prolonged Exposure to Moisture

Washington, D.C. – Besides high thermal resistance per inch (R-Value per inch), density and compressive strength, one of the key properties of extruded polystyrene (XPS) foam insulation is its low propensity for moisture absorption even after years in service in direct contact with water. The low percent volume of water content measured in samples removed from below grade applications is a consequence of the unique microstructure of XPS. The potential for moisture absorption is often overlooked in specifying foam insulation yet moisture content has a dramatic effect on R-Value.

The Extruded Polystyrene Association (XPSA) explains the various aspects of moisture absorption in three new *Technical Insights*:

1. Limitations of Short-Term Testing of XPS and EPS Polystyrene Foam Insulation: An Overview of Moisture Absorption in Polystyrene Foam Insulations

2. Moisture Absorption Mechanisms in Polystyrene Foams Are Keys to Predicting Long-term Performance: XPS and EPS Behave Differently in Moist Below-Grade Applications

3. Simple Experiments Demonstrate How Water Moves More Freely through EPS than XPS

The first *Technical Insight* reviews well-known technical papers, which stress the importance of moisture-absorption data from samples extracted from water-contact installations after long-term exposure up to 30 years. It includes fourteen references to research from notable authors spanning nearly 50 years of polystyrene foam insulation research.

The second *Technical Insight* highlights the physical mechanisms that contribute to moisture absorption. Capillary action is the dominant mechanism in expanded polystyrene (EPS) while diffusion is present in both XPS and EPS. (See Figure 1.)

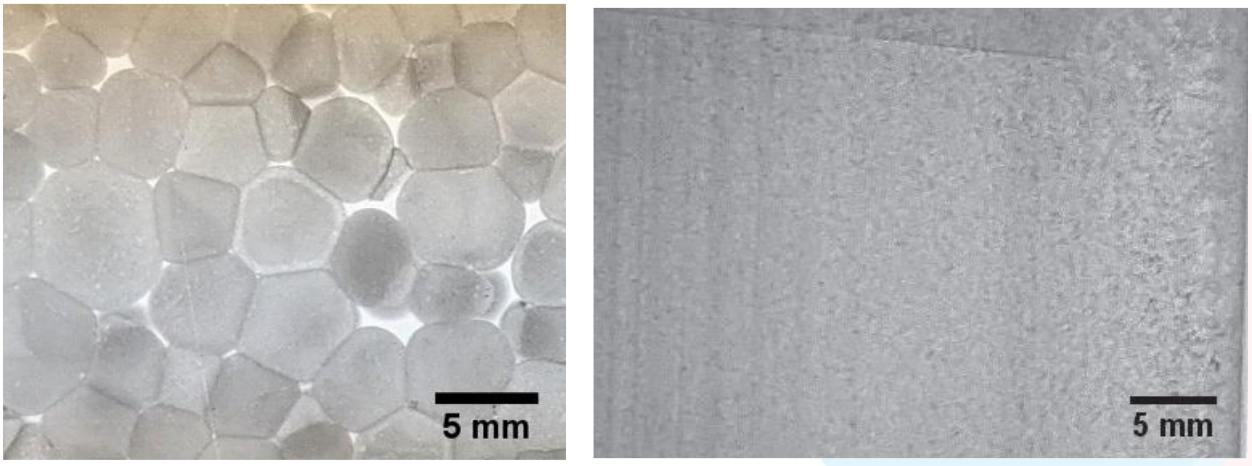

Figure 1. EPS (left) and XPS (right) have different structures as viewed under a microscope.

Finally, the third *Technical Insight* illustrates how microstructures of EPS and XPS contribute to differences in moisture absorption. The side-by-side images at the same scale clearly show the essential difference between EPS and XPS. (See Figure 2.) The consequences of these different structures are illustrated by two simple experiments of the capillary action using dyed water. The absorption of dyed water through the voids and channels of EPS stands in stark contrast to the lack of absorption of dyed water by XPS.

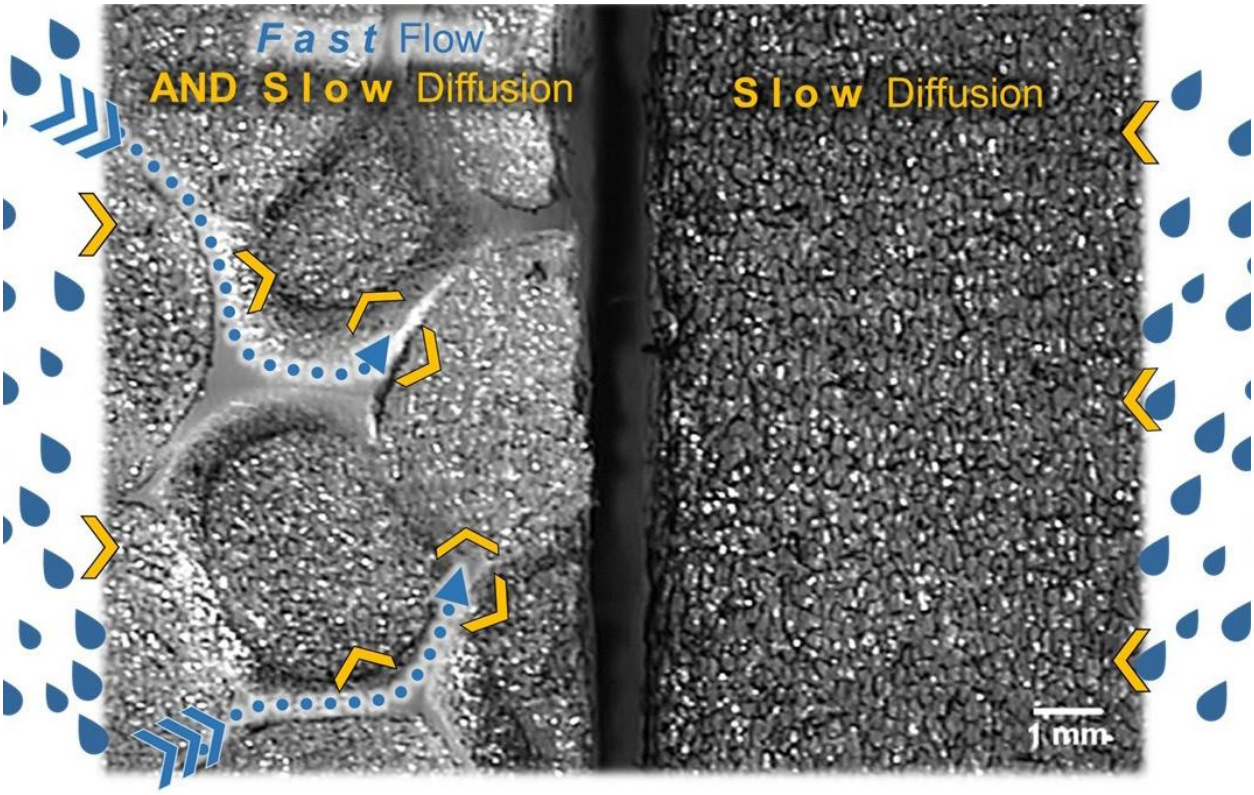

Figure 2. EPS and XPS micrographs side-by-side with graphic representations of moisture.

For deeper insights into the moisture mechanisms of polystyrene foam insulations, refer to "Effects of Moisture Absorption Mechanisms on In-Service Design R-Values of Polystyrene Insulation: XPS and EPS Behave Differently in Moist Below-Grade Applications" (13 pages, four figures and 22 references).

These are all are available for downloading from XPSA's "Technical Information" webpage at https://xpsa.com/technical-information/. The new white paper is the second in the XPSA Insulation Performance Series.

ABOUT XPSA

XPSA represents all major extruded polystyrene (XPS) foam insulation manufacturers in North America. The association and its members are committed to the safety and integrity of XPS products. They invite interested parties seeking additional information to visit XPSA online at www.xpsa.com or to email office@xpsa.com

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