Hydrochromic Coating for Wet-Floor Hazard Detection: Visual Detectability, Slip Resistance, and Drying Behavior

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Slips, trips, and falls are a major cause of lost-workday injuries, with unexpected wet flooring a primary contributor. Wet surfaces present a hazard because water reduces traction and is often difficult to detect visually before stepping into it. This project investigated whether hydrochromic coatings, which become transparent when wet, could increase wet-floor detectability at realistic walking approach distances without reducing slip resistance or increasing drying time. Porcelain tiles were coated with hydrochromic ink at multiple concentrations (33%, 50%, 66%, and 100%), with detailed testing focused on 66% and 100% concentrations. Wet/dry contrast was measured at seven viewing angles (90° to 13° from horizontal) using controlled photography and grayscale image analysis. Slip resistance was measured using a calibrated tribometer under wet test conditions, and drying time was determined through fixed-camera video analysis. At a 25° viewing angle (˜11 ft look-ahead), the 66% and 100% coatings produced 3.9× and 4.1× higher wet/dry contrast than uncoated tile. The slip-resistance index increased with concentration, with the 100% coating showing a 34% increase over uncoated tile. Coated tiles dried 2.5–5.4× faster than controls. The 66% formulation delivered performance comparable to 100% while offering advantages of shorter drying time and easier application, making it the leading candidate for further durability testing.

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