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Preparation and Certification of Novel Reference Material for Smoke Density Measurements

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Abstract: A novel type of reference material has been prepared and characterized for smoke density chamber calibration in the flame condition by Fire Protection Laboratory, National Institute of Standards, Egypt. The new reference material was fabricated by mixing modified magnesium hydroxide nanoparticles (MH-NP-OP) with acrylonitrile–butadiene–styrene copolymer (ABS). The reference material was certified for the physical properties of maximum specific optical density (Dm) and corrected maximum specific optical density (Dmcorr) using the analysis of two different competent laboratories. Preparation, characterization, homogeneity testing and certified value assignment for the developed reference material have been studied. It was clearly demonstrated that the smoke measurement of the two laboratories are harmonic which is an obvious prerequisite for the confidence assessment of the reference material. A metrological approach was followed to detect the statistical biases between different laboratories data to achieve an appropriate accuracy in smoke measurements. The obtained measurement results were statistically analyzed and the certified values of Dm and Dmcorr for reference material were estimated as 510.35 and 472.95, respectively as well as their expanded relative uncertainties at confidence level 95% were recorded 2.78 and 2.7%, respectively. The developed reference material are expected to be used to assist in validating smoke measurements of different materials to realize their fire hazard when be used in building.

Keywords: Standard reference material; Interlaboratory comparison; Magnesium hydroxide nanoparticles; Smoke density chamber; Flaming mode