

Indoor chemical air contaminants in main prayer hall during Jumaat prayer in mosques with different mechanical ventilation

ABSTRACT

Muslims generally pray five times a day. Every Friday, adult male Muslims congregate to perform Jumaat prayer, causing increased number of worshippers in mosques and vehicle movements. Consequently, indoor chemical air contaminants are produced inside and outside mosques. This study evaluated the compliance of indoor chemical air contaminants (CO, O₃, TVOC, CH₂O, and PM₁₀) during Jumaat and Asar prayers in two mosques having different mechanical ventilations (i.e., air conditioning and non-air conditioned system) with the guideline limit recommended by Malaysia's Industrial Code of Practice. Chemical air contaminants were monitored from 1200H to 1700H in the air-conditioned mosque and from 1200H to 1730H in the non-air conditioned system mosque, which were the times for Jumaat and Asar prayers. The monitoring was conducted from November 2016 to March 2017, during the Northeast monsoon. Results showed that the mean concentrations of the four chemical air contaminants in both mosques did not exceed the acceptable guideline limit. The mean CO, TVOC, CH₂O, and PM₁₀ concentrations in the air-conditioned mosque were 0.29 ppm, 354.09 ppb, 31.28 ppb, and 13.45 µg/m³; those in the non-air conditioned system mosque were 2.36 ppm, 344.32 ppb, 19.78 ppb, and 49.91 µg/m³, respectively. However, the air-conditioned mosque's maximum PM₁₀ concentration of 164.48 µg/m³ exceeded the acceptable guideline limit of 150 µg/m³. Moreover, both mosques' mean O₃ concentrations of 140 and 80 ppb exceeded the limit of 50 ppb, respectively. These results suggested that the concentrations of three chemical air contaminants (TVOC, O₃, and CH₂O) in the air-conditioned mosque were higher than those in the non-air conditioned system mosque possibly because of the inadequate ventilation system inside the air-conditioned building. Therefore, air-conditioned mosques should have a good ventilation system to provide suitable temperature and humidity for the Jemaah, as well as sufficient amounts of air to remove indoor chemical air contaminants.

Keyword: Carbon monoxide; Formaldehyde; Indoor air quality; Ozone; Particulate matter