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Abstract:The possibility of measuring the concentration of H<inf>2</inf>O molecules in flames based on the absorption of terahertz free-electron laser radiation was studied. These measurements were performed using the 177.32 cm⁻¹ absorption line in the rotational spectrum of H<inf>2</inf>O. This line has a low intensity at room temperature, and at about 1000 K, its intensity is comparable to that of the strongest lines. The temperature dependence of the radiation absorption coefficient at a frequency of 77.32 cm⁻¹ was studied theoretically and experimentally. It is shown that the method can be used for measurements in a sooty C<inf>2</inf>H<inf>4</inf>/O<inf>2</inf>/Ar flame, which strongly scatters visible and UV radiation. © 2012 by Pleiades Publishing, Ltd.
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