

乙烷/H₂O/O₂/N₂体系中光致过氧化物的产生

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摘要 采用长光路Fourier红外光谱(LP-FTIR)和高压液相色谱(HPLC)技术研究了乙烷/H₂O/O₂/N₂光化学体系中过氧化物的产生,证实乙烷降解产物中有过氧化氢、乙基过氧化氢(CH₃CH₂OOH,EHP)和过氧乙酸[CH₃C(O)OOH,PAA],并首次发现了甲基过氧化氢(CH₃OOH,MHP)、羟甲基过氧化氢(HOCH₂OOH,HMHP)和过氧甲醚(CH₃OOCH₃,DMP).H₂O₂,MHP和EHP的最大计算产率分别为6.8%, 6.4%和6.7%,是乙烷降解生成的主要过氧化产物。MHP主要来自乙烷降解过程中的中间物乙醛的光解。HMHP的检出表明乙烷降解过程中可能有Criegee中间体.CH₂O₂产生。OH自由基引发的乙烷降解反应可能是对流层大气H₂O₂, MHP及EHP的重要来源之一。

关键词 乙烷 高速液体色谱 光化学烟雾 红外分光光度法 羟基 自由基反应 降解反应 光化学反应 过氧化物

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Photo-induced peroxide formation in the ethane/H₂O/O₂/N₂ system

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Abstract Photochemical formation of peroxides in the ethane/H₂O/O₂/N₂ system was studied with LP-FTIR and HPLC techniques. Hydrogen peroxide, ethyl hydroperoxide (CH₃CH₂OOH, EHP) and peroxyacetic acid [CH₃(O)OOH, PAA] were proved to be the peroxide products in the degradation of ethane. Moreover, methyl hydroperoxide (CH₃OOH, MHP) hydroxymethyl hydroperoxide (HOCH₂OOH, HMHP) and dimethyl peroxide (CH₃OOCH₃, DMP) were identified for the first time in the system. The dominant peroxide products were H₂O₂, EHP and MHP with the maximum calculated yields of 6.8%, 6.4% and 6.7%, respectively. MHP was mainly generated from the photolysis of acet aldehyde formed in thee degradation of ethane. The identification of HMHP provide san evidence for the formation of Criegee intermediate.CH₂O₂. in the degradation of ethane. The OH radical initiated degradation of ethane was possibly one of the main sources of H₂O₂, MHP and EHP in the troposphere.

Key words [ETHANE](#) [HIGH SPEED LIQUID CHROMATOGRAPHY](#) [PHOTOCHEMICAL SMOG](#) [INFRARED SPECTROPHOTOMETRY](#) [HYDROXY GROUP](#) [FREE RADICAL REACTION](#) [DEGRADATION REACTION](#) [PHOTOCHEMICAL REACTION](#) [PEROXIDE](#)

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