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OH DETECTION BY FORD MOTOR COMPANY

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Dr. Wang presented two different methods for detection of OH: a low-pressure flow cell system and a frequency modulation absorption measurement. He did not provide the requested one-page description of each method, and this description is taken from D. R. Crosley's notes during Wang's talk.

Using conventional absorption spectroscopy, Wang quoted detection limits of 10^6 OH molecules per cm^3 using a 30-minute averaging time on the ground, and a 3-hour averaging time in the air for present apparatus in use at Ford. With the addition of FM spectroscopy at 1 GHz, a double-beam machine should permit detectable absorption of 10^{-7} and an OH limit of 10^5 per cm^3 in a 30-minute averaging time.

In the low-pressure system on which experiments are ongoing at Ford, nonexponential time behavior was observed after the decay had progressed to about 0.3 of its original level; this was attributed to ion emission in the photomultiplier. A flame source with OH present at high concentration levels was used as a calibration. It was estimated that within the sampling chamber, 4×10^5 OH could be measured. With a factor-of-2 loss at the sampling orifice, this means detectability of 5 to $8 \times 10^5/cm^3$ at the present time. This could be reduced by a factor of 2 in one hour averaging time; improvements in laser bandwidth and energy should provide another factor of 2 in sensitivity.

Comments

Questions were raised as to the cooling which might occur upon expansion. A Boltzmann plot of the rotational population distribution appeared nonthermal. Are the rotational and translational temperatures the same under these conditions?