Reaction 39 produces an alkyl radical (R) which contains a free electron. This radical quickly picks up an oxygen molecule from the air to form a peroxyl radical RO_2:

$$R + O_2 \xrightarrow{M} RO_2. \quad (40)$$

Typically, the next reaction in the series converts NO to NO_2 and produces an alkoxyl radical, RO:

$$RO_2 + NO \longrightarrow RO + NO_2. \quad (41)$$

A hydrogen abstraction by molecular oxygen may then produce a hydroperoxyl radical, HO_2. The rest of such an RO radical typical forms a carbonyl compound, OHC:

$$RO + O_2 \longrightarrow OHC + HO_2. \quad (42)$$

Finally, the hydroperoxyl radical (HO_2) can react with a second NO to form NO_2 to complete the cycle:

$$HO_2 + NO \longrightarrow OH + NO_2. \quad (43)$$

Although this description is very simplified, these series of reactions contain the essential features of NO to NO_2 oxidation and subsequent ozone formation.

The initial source of radicals is very important; although the rate and yield of oxidant formation depend on many other factors, the length of the induction period before accumulation of oxidant depends strongly on the initial concentration of radicals. (The length of the induction period is important primarily in constant light intensity smog chambers. Diurnally varying radiation tends to lessen the importance considerably.) In smog chambers and possibly in the ambient atmosphere, the photolysis of nitrous acid, reaction 36, may be the most important initial source of radicals. Nitrous acid has been detected in smog chambers in concentrations sufficient