

absence of experimental data, one might postulate a behavior similar to that of sulfates. As far as chemical formation rates are concerned, some theoretical estimates suggest that wintertime rates for particulate nitrate may be considerably greater than those in the summer (Middleton and Kiang, 1979), but again, this result requires experimental verification.

The other major nitrate product to be considered is peroxyacetyl nitrate. This substance is stated by Hill (1971) as being "relatively insoluble," and Garland and Penkett (1976) found negligible PAN uptake rates by water in a wind tunnel. This suggests a relatively low value of the scavenging coefficient. The dependence of PAN solubility on the temperature, and the nature of its interactions with snow, are unknown; therefore, we will not speculate on the seasonal dependence of its wet scavenging rate. Some data are available on the dry deposition rate of PAN over a number of surfaces (Table 7), and, with the exception of water, the PAN deposition velocity seems to be about one-third that for SO<sub>2</sub>. Again, due to lack of supporting data, speculation on the seasonal dependence of the PAN dry deposition rate is not possible.

As far as chemical formation rates are concerned, PAN is the product of photochemical reactions involving peroxyacetyl radicals and NO<sub>2</sub>:



The proportion of PAN and HNO<sub>3</sub> appearing in the irradiated, polluted air mixture depends on the level of hydrocarbons present in the mixture (Spicer et al., 1980), but limited field measurements suggest that the two products can exist in comparable amounts (e.g., Spicer, 1979). Thus, PAN formation rates are expected to be several percent per hour under conditions where photochemical reactions are important. As far as the seasonal dependence of the PAN formation rate is concerned, one would expect it to be qualitatively similar to that resulting from the photochemical components of the sulfuric and nitric acid formation rates (see also Bottenheim et al., 1977), but it must be noted that the PAN formation reaction (see above) is reversible. The stability of PAN is a strong function of the temperature, and its atmospheric half-life at 275°K is about two orders of magnitude greater than that at 305°K