

Investigation of Manganese Trifluoride Thermal Decomposition by Knudsen Cell Mass Spectrometry

- M. Leskiv, N. Chilingarov, S. Abramov, J. Rau, and L. Sidorov (Moscow State University)

Manganese trifluoride is one of the most widely used fluorinating agents in preparative synthesis. Particularly $\text{MnF}_3(\text{s})$ is known to oxidize platinum and gold with formation of PtF_4 and AuF_3 respectively. Study of thermal decomposition of some fluorination agents ($\text{TbF}_4(\text{s})$, $\text{CoF}_3(\text{s})$, $\text{CeF}_4(\text{s})$ and others) [1, 2] showed the atomic fluorine is the main gaseous product, its pressure increasing the equilibrium value, apparently, as a result of decreasing of F atoms heterogeneous recombination rate. These data allow to conclude that namely atomic fluorine is, on the one hand, "primary" product of solid fluoroagents thermolysis and additionally is the main oxidant in the reactions of solid phase fluorination. It might be supposed that the main oxidant at the solid phase fluorination with manganese trifluoride is also atomic fluorine. In this case, atomic fluorine elimination at the thermolysis of $\text{MnF}_3(\text{s})$ is also to be expected. Earlier MnF_3 , Mn_2F_6 and MnF_4 molecules were detected in the saturated vapor of manganese trifluoride. However, in spite of considerable number of studies of the gas phase composition no evidence neither for atomic nor for molecular fluorine was reported.

The present work is devoted to determination of $P(\text{F})$ and $P(\text{F}_2)$ values at manganese trifluoride thermolysis under

different conditions. Gas phase composition at $\text{MnF}_3(\text{s})$ evaporation from a preliminary fluorinated nickel cell in the temperature range 800-1000 K was investigated by high temperature mass-spectrometry technique. Comparison of the experimental values of $P(\text{F})$ and $P(\text{F}_2)$ with their equilibrium ones was made. The equilibrium constants for the reactions between the products of $\text{MnF}_3(\text{s})$ decomposition were calculated, and some assumptions concerning to the achievement of chemical equilibrium in systems under study were made.

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2. J.V. Rau, N.S. Chilingarov, M.S. Leskiv, V.F. Sukhoverkhov, V. Rossi Albertini, L.N. Sidorov. Transition and rare earth metal fluorides as thermal sources of atomic and molecular fluorine. // *J. Phys. IV France* 11 (2001) Pr3-109.