Uranyl Fluoride (UO_2F_2)

The presence of UO_2F_2 is characterized by a cloud of white, smoke-like vapor. A nuclear scientist from a French enriched fuel fabrication plant warns that,

> "... even a slow leakage of UF_6 will give rise to the formation of an opaque and toxic cloud of uranyl fluoride (UO_2F_2), which would rule out any possibility of local remedial action unless gas-tight safety equipment including self-contained breathing apparatus is available."[15]

UO_2F_2 is formed as a very fine powder with a particle size of 0.5 microns.[16] Such small particles settle very slowly, leading to greatest deposition away from the accident site if a wind is blowing. Concentrations of about one mg/m^3 UO_2F_2 are visible,[17] and visibility does not exceed 90 cm at concentrations of one g/m^3.[18]

One of the worst UF_6 accidents known took place at the Comurhex conversion plant in France. The accident is described in detail in Chapter 15. In a report on the accident the manager of the plant wrote,

> "Only a few hundred grams of UF_6 released in a closed facility will create a toxic and blinding cloud for the operators. There is a risk that they would not readily find the emergency exits."[19]

The Plugging Phenomenon

In the case of a slight leak through a UF_6 cylinder wall or valve, at low enough temperatures, the UF_6 will cool as it passes through the hole, solidify and quickly form a plug.[20] This plug of uranium will block leakage into and out of the hole. How low a temperature is required for a plug to form has not been found in a review of the technical literature. Plugs were formed at sea water temperatures in the *Mont-Louis* accident (documented in Chapter 14). An experiment was carried out by the U.S. Department of Energy (DOE) in which a cylinder containing UF_6 was placed under water and a valve removed to permit water to enter the cylinder. Unexpectedly, the reaction led to plugging of the hole, stopping any more water from entering. According to a DOE expert, formation of the plug "is a phenomenon that we don't quite understand."[21]

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[15] Blum, 1978, p. 168; in: OECD, 1978.
[16] Elert, 1989, p. 11.
[17] Thomas, 1978 p. 250; in: OECD, 1978.
[18] Bouzigues, et. al., 1978, p. 344; in: OECD, 1978.
[19] Bouzigues, et. al., 1978, p. 344; in: OECD, 1978.
[20] Ringot and Hamard, 1988, p. 31; in: Strunk and Thornton (eds), undated.
[21] *Nucleonics Week*, 30 August 1984, p. 2.