SUPPORTING INFORMATION:

EXPERIMENTAL SECTION

At the TRIGA Mainz reactor, short-lived isotopes of the 4d element Mo were produced by neutron-induced fission ($9.8 \cdot 10^{10}$ (neutrons · $cm^{-2} \cdot s^{-1}$)) of a 350 µg ^{249}Cf target (covered with ~15 µm Al), which was placed in a chamber near the reactor core. The chamber was flushed with N_2 (Westfalen Gas, 99.997%) or a mixture of N_2 and CO (Westfalen Gas, 99.97%). The gas was dried by passing a Sicapent™-filled cartridge and then entered the target chamber, which was kept at temperatures of 20-30 °C. Volatile fission products and volatile compounds were flushed through a 10-m long perfluoroalkoxy (PFA) capillary (1.6 mm inner diameter, i.d.) to charcoal traps, where they were collected. The traps were made of 5-cm long polyethylene tube (4 mm i.d.) filled with approximately 100 mg activated charcoal (20 – 40 mesh). The charcoal was kept in place by quartz wool plugs. The traps were assayed with a γ–ray detector (EG&G Ortec GEM- 50195 S, relative efficiency: 53.5%).

Isothermal chromatography experiments: the dried gas passed through the target chamber, then through a PFA capillary into a 2-m long SiO_2 column (2 mm i.d.). The column was cooled on a length of 1.91 m with an ethanol dry-ice mixture. The temperature was varied by changing the dry-ice to ethanol ratio. After passing the column, the gas passed a charcoal trap, which was assayed with the γ–ray detector, then through the Sicapent™ drying unit, and entered the target chamber again. This gas-loop system ensured that the gas was very dry, important to avoid the formation of an ice layer on the chromatography column.

To normalize the relative transport yields to that of a N_2/KCl aerosol gas-jet, an experiment was performed using such a jet: pure N_2 which passed through a tube furnace containing KCl at 640 °C. KCl aerosol particles formed in the gas and were flushed through the target chamber. Non-volatile fission products attached to the particles and were transported with the gas flow to a charcoal trap acting as a filter.

At GSI, short-lived isotopes of the 5d elements W and Os were produced in the heavy-ion induced fusion reactions $^{144}Sm(^{24}Mg,5n/4n)^{163/164}W$ and $^{152}Gd(^{24}Mg,6n/5n)^{170/171}Os$. A 150-MeV ^{24}Mg beam passed through ~2-µm thick Ti target backings, on which ~0.38 mg/cm^2 Sm (88.6% enriched in ^{144}Sm) for the production of W or ~0.31 mg/cm^2 Gd (39.9% enriched in ^{152}Gd) for the production of Os were deposited. Three target segments were mounted on a rotating wheel (ARTESIA [1]) to allow beam intensities of up to $1.3 \cdot 10^{12}$ ions/s. In each measurement, $2.48 \cdot 10^{15}$ ^{24}Mg ions passed through the target. The desired nuclear fusion products were isolated in TASCA operating in its "Small Image Mode (SIM)" [2] and filled with 0.8 mbar He (99.9999%). Ions with a magnetic rigidity of 1.59 T·m were guided to the center of the focal plane of TASCA. There, the fusion products penetrated a (3x4) cm^2 large, 3-µm thick Mylar™ foil that separated the low-pressure region in TASCA from the 0.8 bar region inside the Recoil Transfer chamber (RTC). The foil was supported by a honeycomb grid (80% transparency). In the RTC (3 cm i.d., 3 cm deep), the fusion products were thermalized in a mixture (1:1) of He (Linde, 99.9999%) and CO (Linde, 99.9%), which flushed the RTC (total gas flow rate: 0.8 L/min). The gas was dried by passing molecular sieve cooled with liquid N_2 prior to entering the RTC, and was then kept at room temperature throughout the section where synthesis of the complexes took place. After the RTC, the gas passed through a 2-m long PFA capillary (2mm i.d.) and entered the Cryo-Online Multidetector for Physics And Chemistry of Transactinides (COMPACT).[3] COMPACT is a gas chromatography detector suitable for registering α-particles emitted from samples decaying inside the chromatography column.

This consists of (1×1) cm^2 positive intrinsic negative (PIN) α-detectors covered with a SiO_2 layer. 32 such detectors are mounted in an Invar™ panel. Two panels are assembled to form a 32-cm long chromatography column with a (1×0.06) cm^2 cross section. A negative temperature gradient from +12°C to -110°C was applied along the column by contacting one end of the Invar™ bar with an LN_2-cooled cold finger. The Invar™ panels were placed in an evacuated steel box to prevent the formation of ice layers. The box was covered with a Ni layer to reduce the influence of electromagnetic fields. The temperature gradient along the column was monitored with 4 thermoelements (type K).

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