Electronic Supplementary Material (ESI) for Physical Chemistry Chemical Physics.

Supporting information

Parallel deposition of size-selected clusters: a novel technique for studying size-selectivity on the atomic scale

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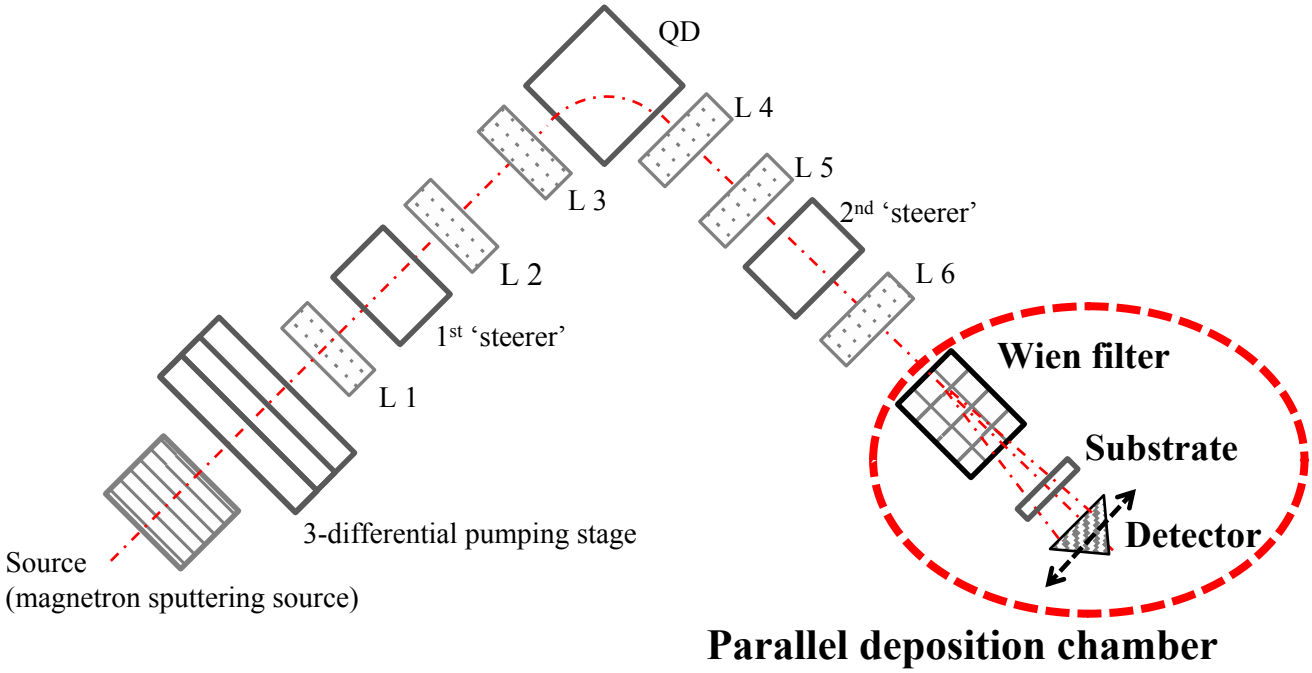
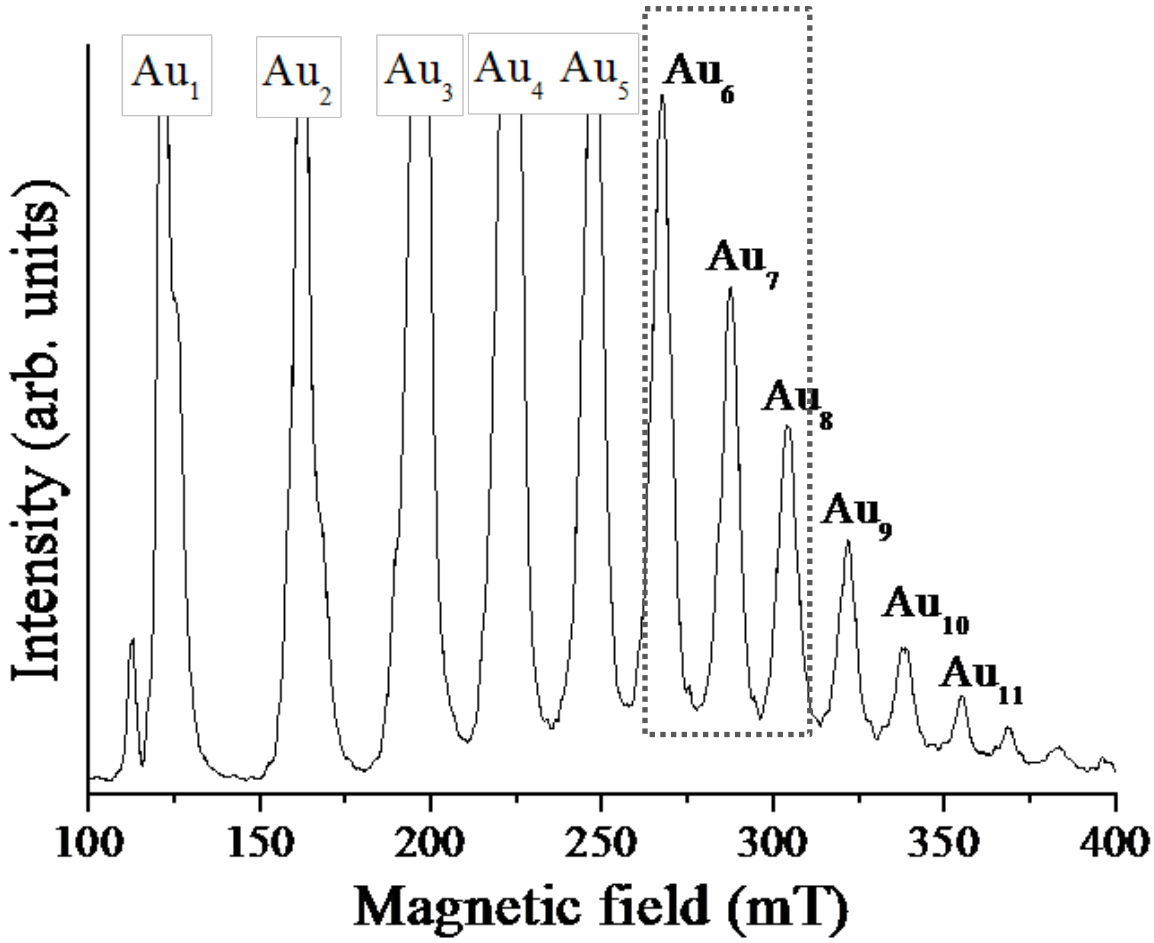


Experimental set-up for the generation of the (+)-charged cluster ion beam is schematically shown. The clusters were produced by Ar-sputtering of a gold (98%) target with a magnetron sputter source. The cluster beam was extracted from the sputter source by 3 differential pumping stages, and then (+)-charged clusters were accelerated by a guiding tube (U_o = -1 kV, as a guiding voltage). The cluster beam was focused by three Einzel lenses (L1, 2, and 3) and its direction was corrected using electrostatic deflectors (1st 'steerers'). After passing through a 90° quadrupole deflector, (+)-charged clusters were extracted from the neutral beam, and then re-focused and guided by Einzel lenses (L4, 5, and 6) and 2nd 'steerers', respectively. This focused (+)-charged cluster ion beam entered the Wien velocity filter and split into several cluster ion beams with various charge to mass (q/m) ratios.

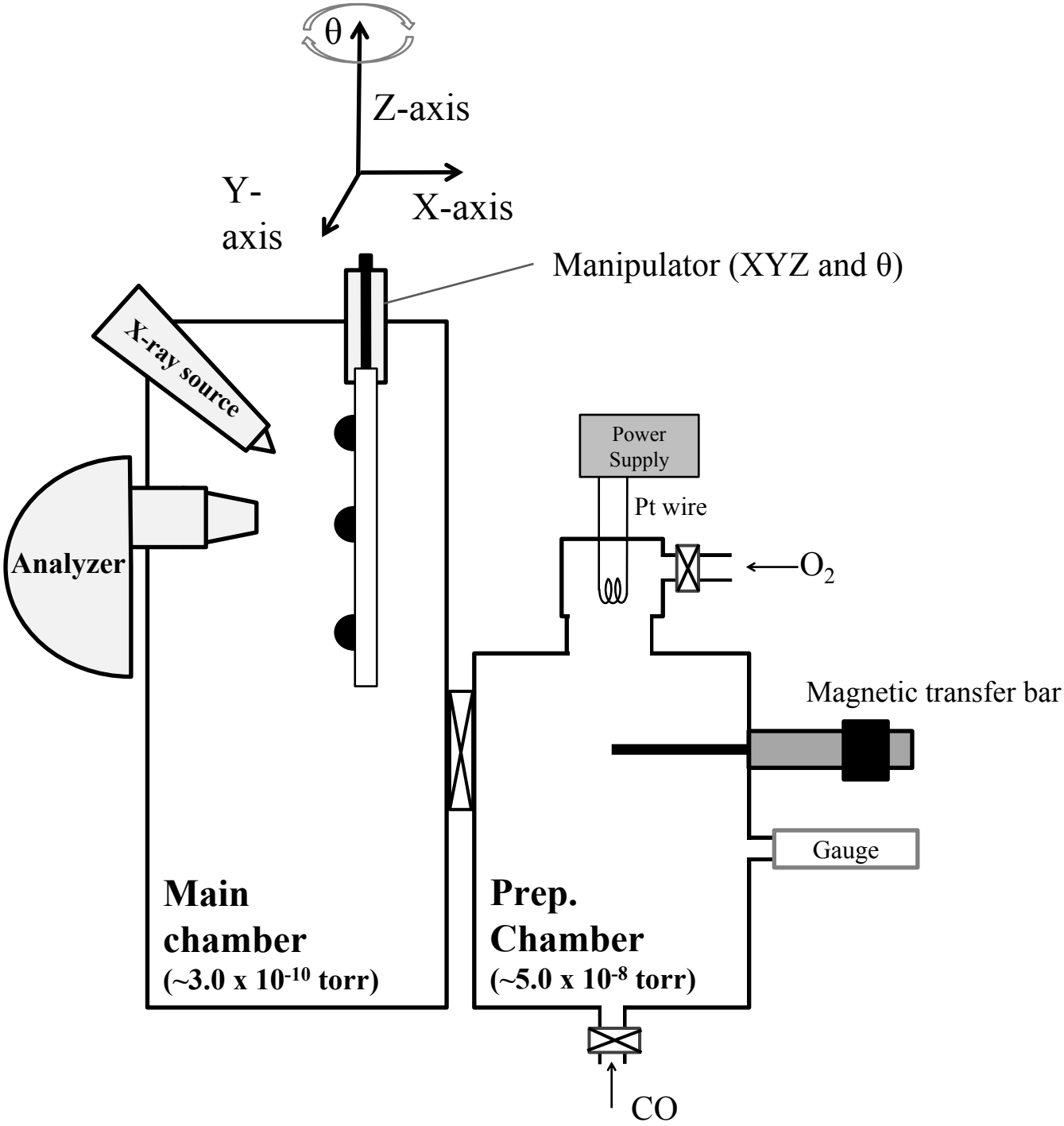
In the present work, a home-made Wien filter with a cuboid tube shape (244 x 20 x 18 mm) and maximum electric field and magnetic field strengths of ~17 kV/m and ~850 mT, respectively, was used. The Wien filter was equipped with an electromagnet so that either the magnetic or electric field could be varied for mass-separation and also for beam-splitting.

Fig. S1



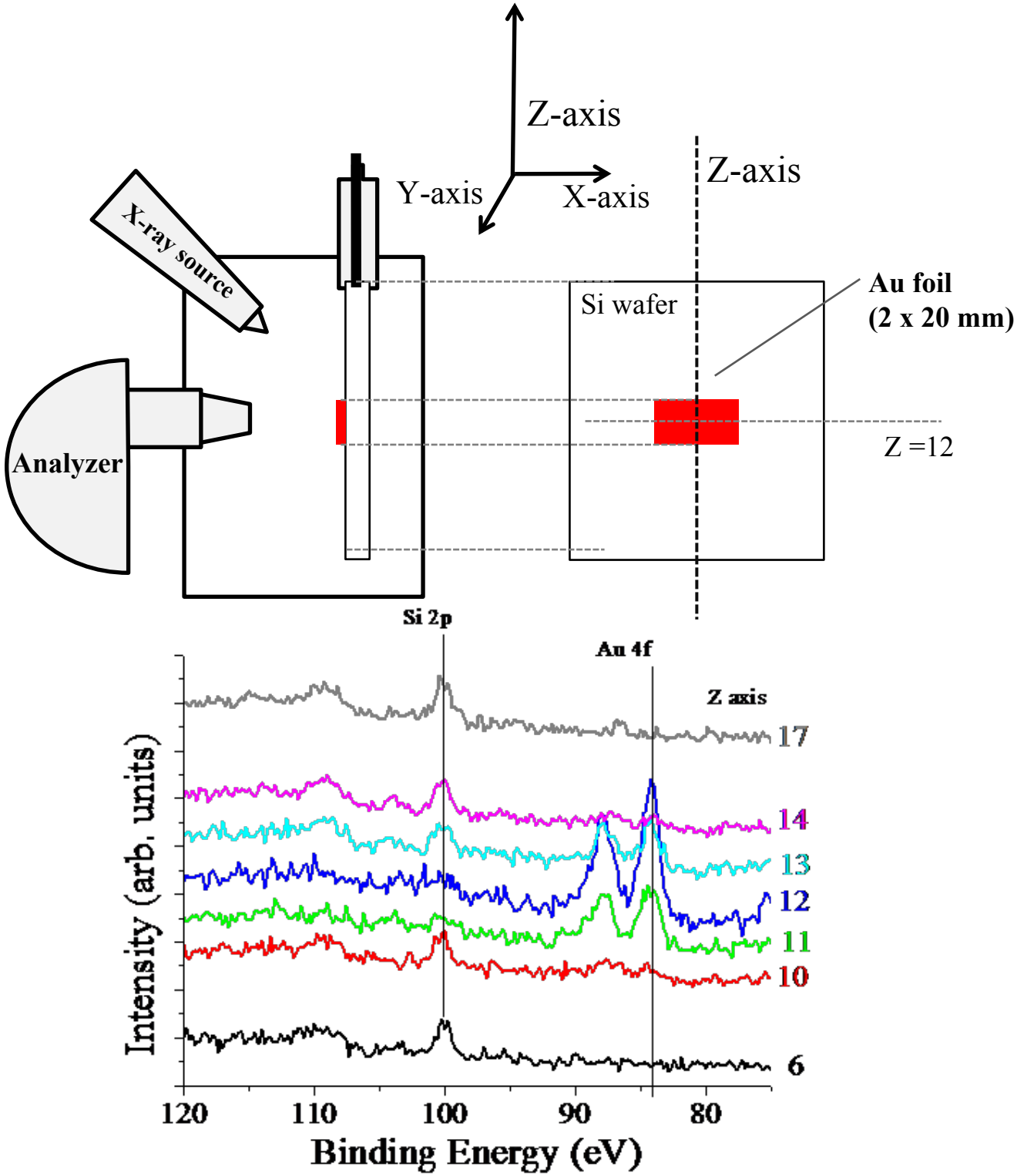
Wien filter mass spectrum of Au_n+ clusters obtained by scanning the magnetic field with a fixed electric field of 100 V is shown. The magnetic field was swept from 0 to 850 mT by a scanning current (A, Ampere) applied from 0 to 75 A on the electromagnet. During the magnetic field scanning, the intensity of the un-deflected (+)-charged clusters was measured by a channeltron detector (CEM, 4821G, Photonics) with a pin hole (0.1 mm) at the center position of the Wien filter.

Fig. S2



The *in situ* XPS set-up used to determine the spatial separation of cluster spots after the parallel-deposition of Au_n clusters (n=6, 7, and 8) on the SiO_2/Si surface is schematically shown. This system was also used for the gas exposure experiments of deposited Au clusters.

Fig. S3



- Spatial resolution of X-ray photoelectron spectroscopy (XPS) was checked with Au foil (2 x 20 mm)
- Au foil with a lateral size of 2 x 20 mm was placed on Si wafer.
- Au 4f and Si 2p core-level XPS spectra were obtained at different Z -axis positions.

Fig. S4