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A new focal plane recoil gas stopping chamber for study of chemistry of super heavy elements at SHE Factory

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In gas phase experiments on the chemistry of superheavy elements at SHE Factory, nuclei recoiled from an irradiated target are separated from the beam and other by-products of nuclear reactions with a physical separator, focused in the focal plane and injected through a thin entrance window into a gas stopping chamber. Recoil nuclei, stopped in a gas mixture, are transported through a capillary by a gas flow to the chromatographic column of the chemical detection setup Cryodetector. Here we report a new compact chamber design developed using finite element analysis in COMSOL Multiphysics for the focal plane of gas-filled separator GRAND at SHE Factory. The defining parameters were image size in the focal plane of the GRAND separator, stopping range of recoil nuclei of Cn and Fl in the separating foil and transport gas, the minimum possible time for recoil nuclei to be flush out from the chamber, the highest possible efficiency of removal of short-lived isotopes of Cn and Fl and inert inner surface of the chamber with respect to volatile elements and compounds.

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