

Supporting Information

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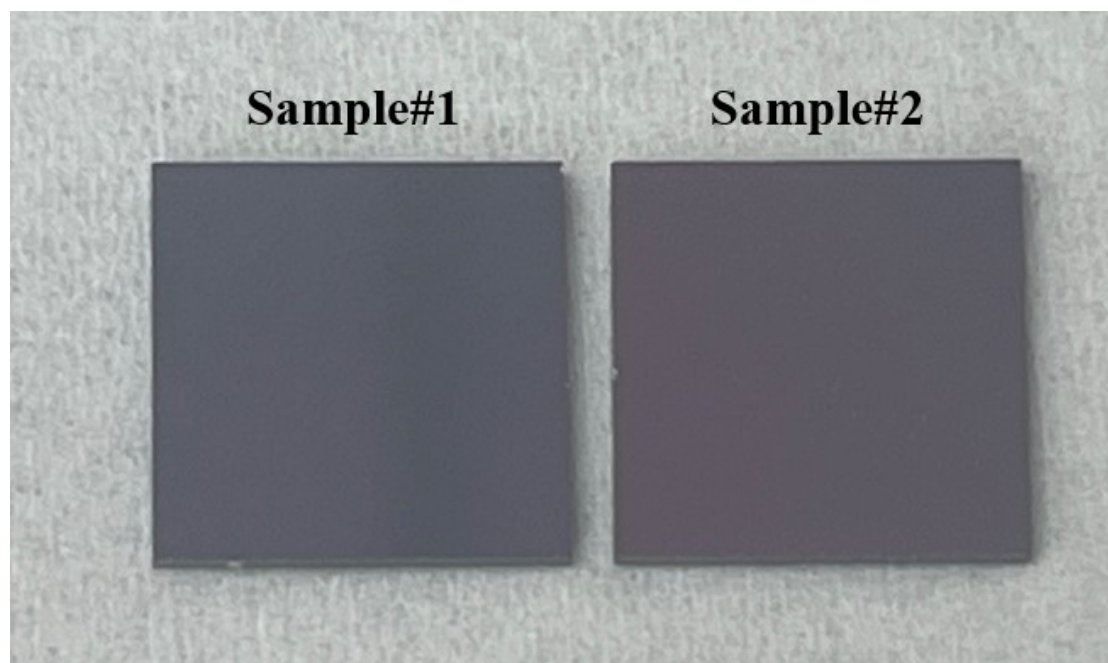
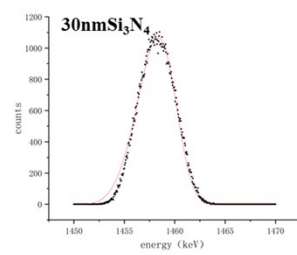
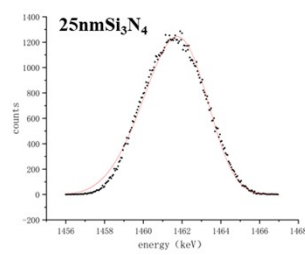
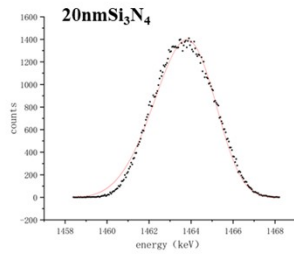
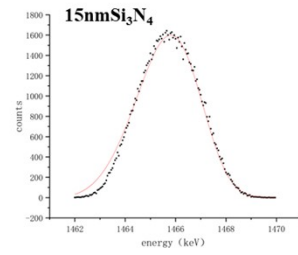
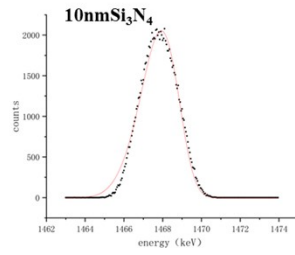
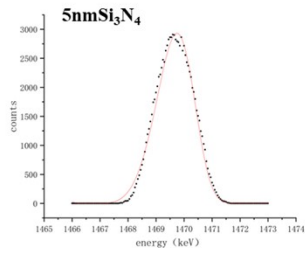


Figure S1. Boro-phospho-silicate Glass coated with a Si_3N_4 thin film

Table S1. Parameters of the fitted curves of the residual energy of 1472 keV ^4He particles after passing through Si_3N_4 films with different thicknesses(5-200nm)

Thickness of $\text{Si}_3\text{N}_4/\text{nm}$	Energy/keV	x_c	a	b	c	R^2	$x_c(\text{Uncertainty})$
5	1469.75	1469.75	2930	3.16	5	0.992	0
10	1467.92	1467.92	2053.3	5.32	5.77	0.990	± 0.2
15	1465.81	1465.81	1600	5.5	4.58	0.990	± 1.9
20	1463.79	1463.79	1395.7	6.38	4.68	0.992	± 0.6
25	1461.75	1461.75	1243.5	7.22	4.70	0.993	± 0.1

30	1458.34	1458.34	1066.9 6	8.74	4.89	0.992	± 0.0 3
35	1456.05	1456.05	1000	8.03	4.2	0.994	± 0.1 3
50	1449.25	1449.25	821.96	8.91	3.82	0.993	± 0.2 7
75	1437.81	1437.81	659	11.01	4.2	0.99	± 0.6 8
100	1426.27	1426.27	856.39	12.09	4.05	0.991	± 1.6 7
200	1380.05	1380.05	932.13	16.21	3.94	0.991	± 0.0 6



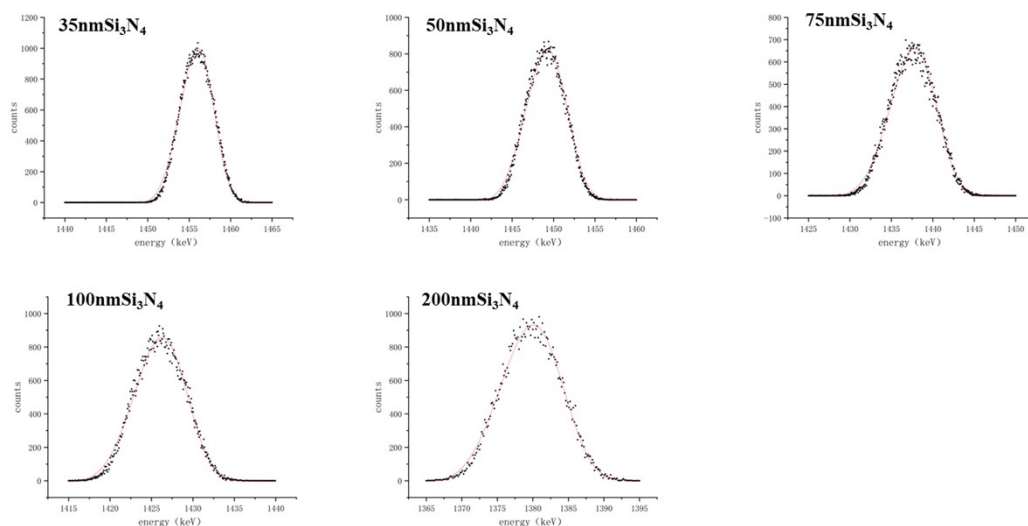


Figure S2. SRIM calculations of the residual energy distribution of 1472 keV α -particles after passing through Si_3N_4 thin films of various thicknesses(5-200nm).

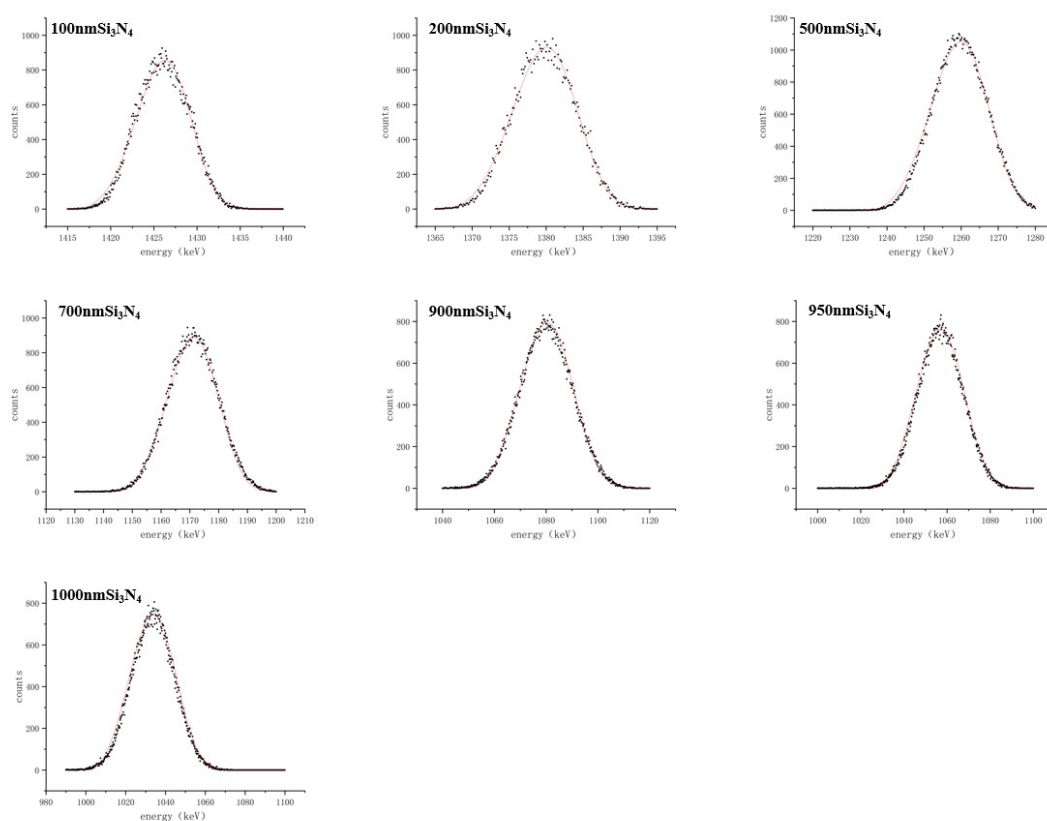


Figure S3. SRIM calculations of the residual energy distribution of 1472 keV α -particles after passing through Si_3N_4 thin films of various thicknesses(100-1000nm).

Table S2. Parameters of the fitted curves of the residual energy of 1472 keV ^4He particles after passing through Si_3N_4 films with different thicknesses (100-1000nm)

Thickness of Si ₃ N ₄ /nm	Energy/keV	x _c	a	b	c	R ²	x _c (Uncertainty)
100	1426.27	1426.27	856.39	12.09	4.05	0.991	±1.6 7
200	1380.05	1380.05	932.13	16.21	3.94	0.991	±0.0 6
500	1260	1260	1051.4 3	29.31	3.99	0.994	±0.5 1
700	1171.37	1171.37	891.34	31.28	3.76	0.994	±2.2 3
900	1080.48	1080.48	793.69	34.89	3.60	0.996	±1.4 6
950	1057.06	1057.06	759.98 6	36	3.42	0.993	±0.0 3
1000	1033.93	1033.93	745.48	38	3.45	0.990	±0.1 3

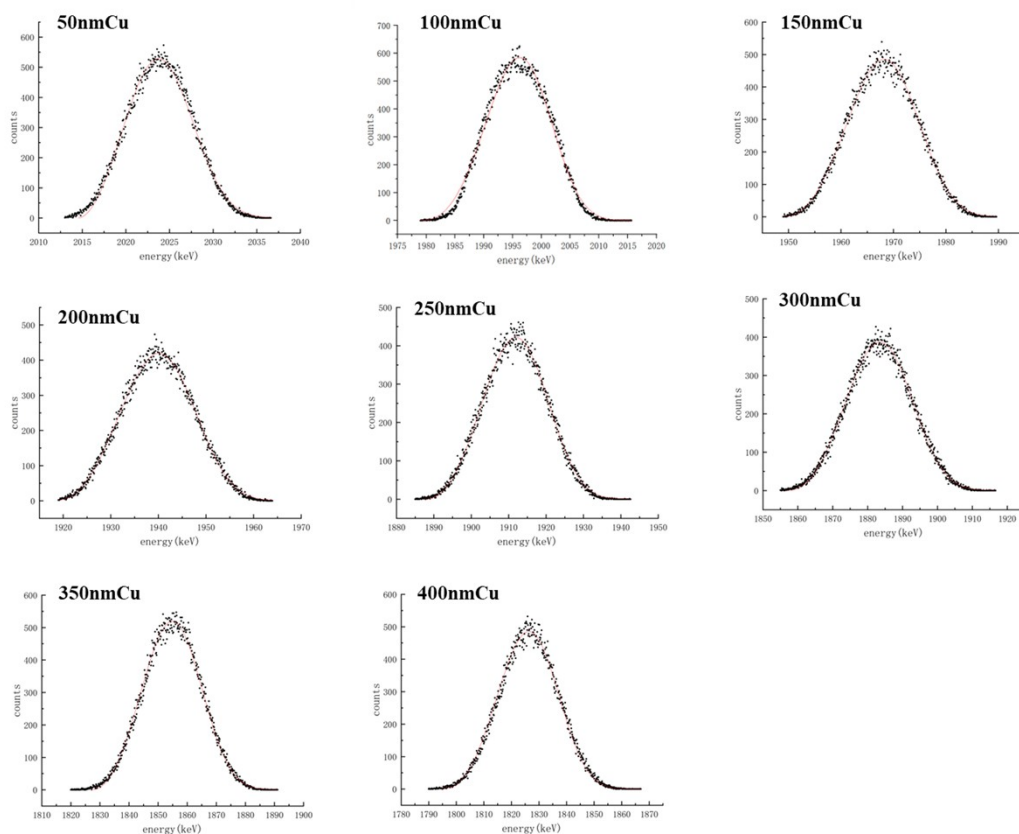


Figure S4. SRIM calculations of the residual energy distribution of 2055 keV α -particles after passing through Cu thin films of various thicknesses.

Table S3. Parameters related to the fitting function of the TRIM model to calculate the energy distribution of alpha particles(Cu Sample)

Thickness of Cu/nm	Energy/keV	x_c	a	b	c	R^2	$x_c(\text{Uncertainty})$
50	2023.74	2023.74	528.11	10.67	2.90	0.991	± 0.04
100	1996.25	1996.25	584.68	19.26	3.62	0.990	± 0.48
150	1968.21	1968.21	484.88	21.93	3.43	0.992	± 0.37
200	1940.08	1940.08	419.20	24.89	3.37	0.993	± 0.24
250	1911.93	1911.93	421.71	27.28	3.30	0.992	± 0.00

300	1883.49	1883.49	386.89	29.77	3.32	0.993	± 0.0
							1
350	1854.87	1854.87	519.48	31.45	3.26	0.993	± 0.0
							3
400	1826.34	1826.34	485.37	35.27	3.43	0.993	± 0.0
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