Energy loss characteristics of Neolith-s for the Cathode=450 μm case

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Abstract

Material list of Neolith-s for the case of the Cathode thickness of 0.45 mm is shown, together with the energy loss characteristics of its tracking section.

1 Material list: Cathode 0.45 mm^t

The list of the materials of Neolith-s, for the case of the Cathode FR4 thickness of 0.45 mm, is given in Table 1. The thickness of the front converter and rear catcher scintillators was assumed to be 6 cm.

2 Energy loss characteristics of protons inside Neolith-s

Energy development of protons with energies of 20, 30, and 40 MeV inside Neolith-s (but excluding the front converter scintillator) is shown in Fig. 1. Similar results for the 50, 70, 100, 150, 200-MeV protons are shown in Fig. 2. Calculations were done with the ELOS code [1].

It is seen that a proton impinging on the tracking section of Neolith-s with an energy of 30 MeV has an energy of 14.8 MeV before reaching the rear scintillator. This value was calculated to be 17.7 MeV for the 0.3-mm-thick Cathode case [2], and 19.5 MeV for the 0.2-mm-thick Cathode case [3].

References

[1] Bethe-Bloch formula for heavy ions (Y.Satou).

[2] Energy loss characteristics of Neolith-s (V2) (Y.Satou).

[3] Energy loss characteristics of Neolith-s for the Cathode=200 μm case (Y.Satou).

Table 1: Material list of Neolith-s (pattern 5, for the case of the Cathode FR4 thickness of 0.45 mm). Front converter scintillator is excluded together with the paper honeycomb. Distance refers to the length measured from the front surface of the first material to the rear surface of each material.

#	material	data_material file name	thickness (cm)	distance (cm)	misc.
End of the converter scintillator section				0.0000	
5.2010 1	vinylchloride	vinylchloride.dat	0.005	0.0050	
2	air	air.dat	1.462	1.4970	
3	Al	aluminum.dat	0.004	1.5010	
4	GFRP	G10_FR4.dat	0.02	1.5210	
5	air	air.dat	2.00	3.5210	
6	GFRP	G10_FR4.dat	0.02	3.5410	
7	FR4	G10_FR4.dat	**0.045**	3.5710	
8	Cu	Cu.dat	0.0018	3.5728	Cathode
9	Ar	Ar.dat	1.27712	4.8499	Ar in P20
10	CH4	CH4.dat	0.31928	5.1692	CH4 in P20
11	Cu	Cu.dat	0.0018	5.1710	Cathode
12	FR4	G10_FR4.dat	**0.045**	5.2010	
13	GFRP	G10_FR4.dat	0.02	5.2210	
14	air	air.dat	2.00	7.2210	
15	GFRP	G10_FR4.dat	0.02	7.2410	
16	Al	aluminum.dat	0.004	7.2450	
17	air	air.dat	4.5	11.7450	
18	Al	aluminum.dat	0.004	11.7490	
19	GFRP	G10_FR4.dat	0.02	11.7690	
20	air	air.dat	2.00	13.7690	
21	GFRP	G10_FR4.dat	0.02	13.7890	
22	FR4	G10_FR4.dat	**0.045**	13.8190	
23	Cu	Cu.dat	0.0018	13.8208	Cathode
24	Ar	Ar.dat	1.27712	15.0979	Ar in P20
25	CH4	CH4.dat	0.31928	15.4172	CH4 in P20
26	Cu	Cu.dat	0.0018	15.4190	Cathode
27	FR4	G10_FR4.dat	**0.045**	15.4490	
28	GFRP	G10_FR4.dat	0.02	15.4690	
29	air	air.dat	2.00	17.4690	
30	GFRP	G10_FR4.dat	0.02	17.4890	
31	Al	aluminum.dat	0.004	17.4930	
32	air	air.dat	1.462	18.9850	
33	vinylchloride	vinylchloride.dat	0.005	18.9900	
34	plastic	plastic.dat	6.0	24.9900	

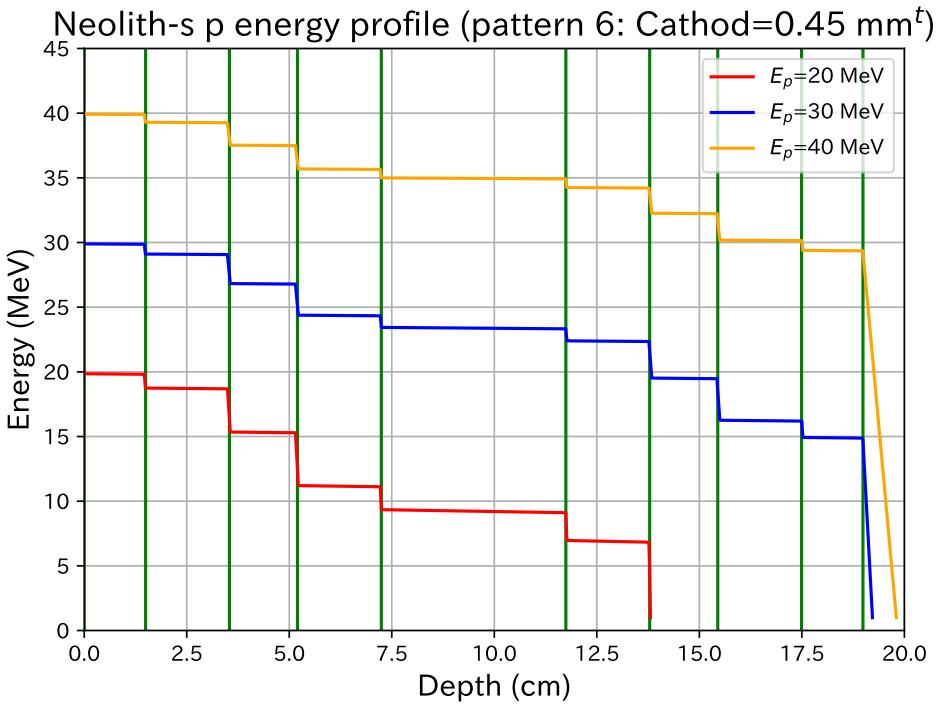

Figure 1: Energy development of protons with energies of 20, 30, and 40 MeV inside the Neolith tracking sections and the rear catcher plastic scintillator. Cathode thickness is 0.45 mm.

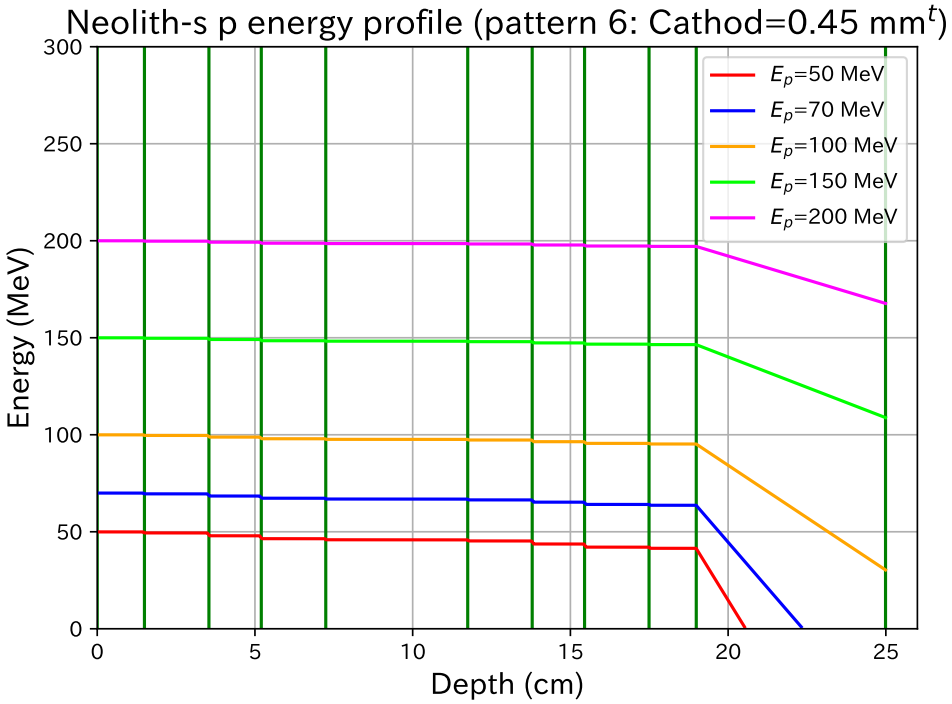

Figure 2: Same as Fig. 1 but for proton energies of 50, 70, 100, 150, and 200 MeV. Cathode thickness is 0.45 mm.