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APPENDICES

APPENDIX A

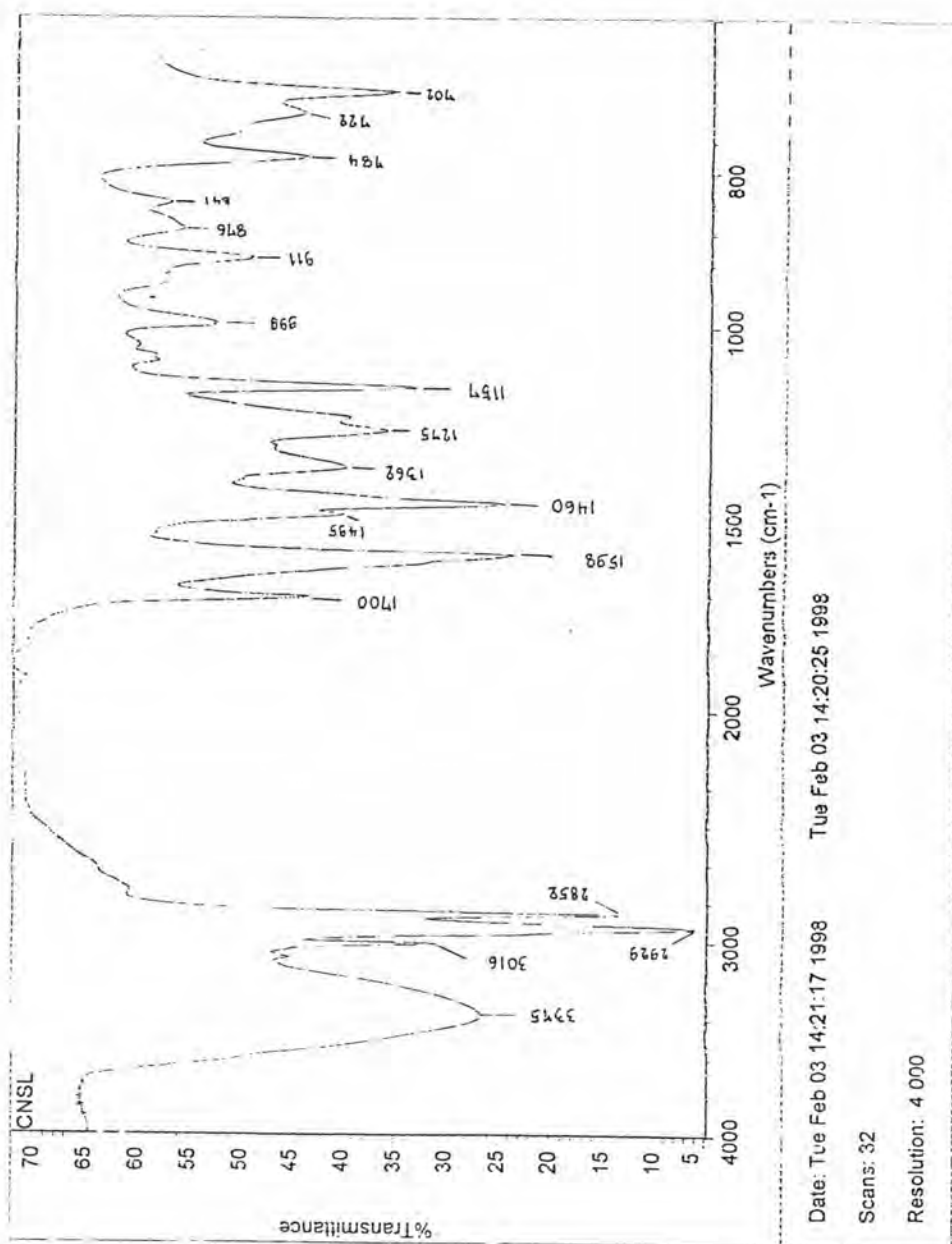


Figure 1. IR spectrum of CNSL

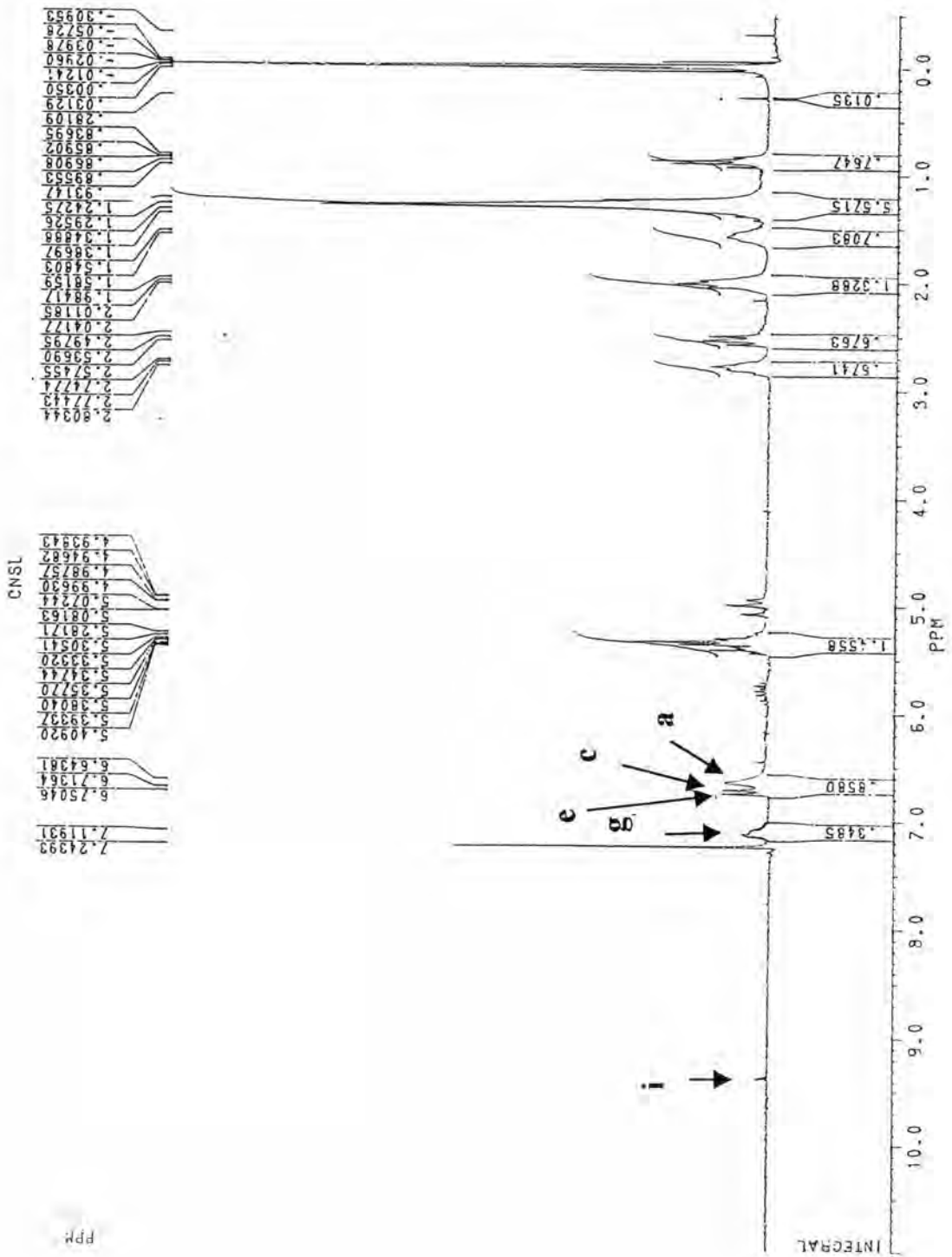
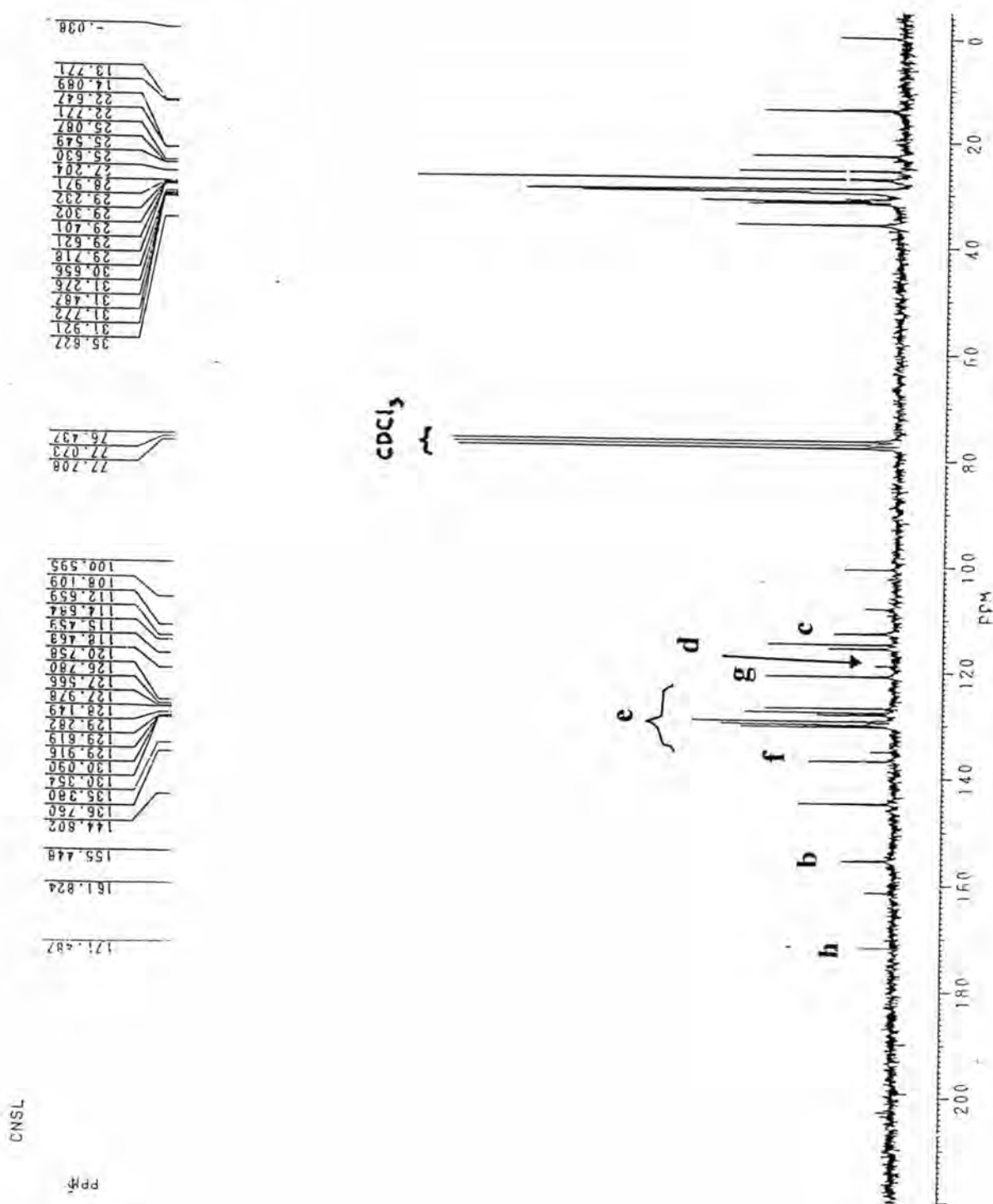


Figure 2. ¹H-NMR spectrum of CNSL

Figure 3. ¹³C-NMR spectrum of CNSL

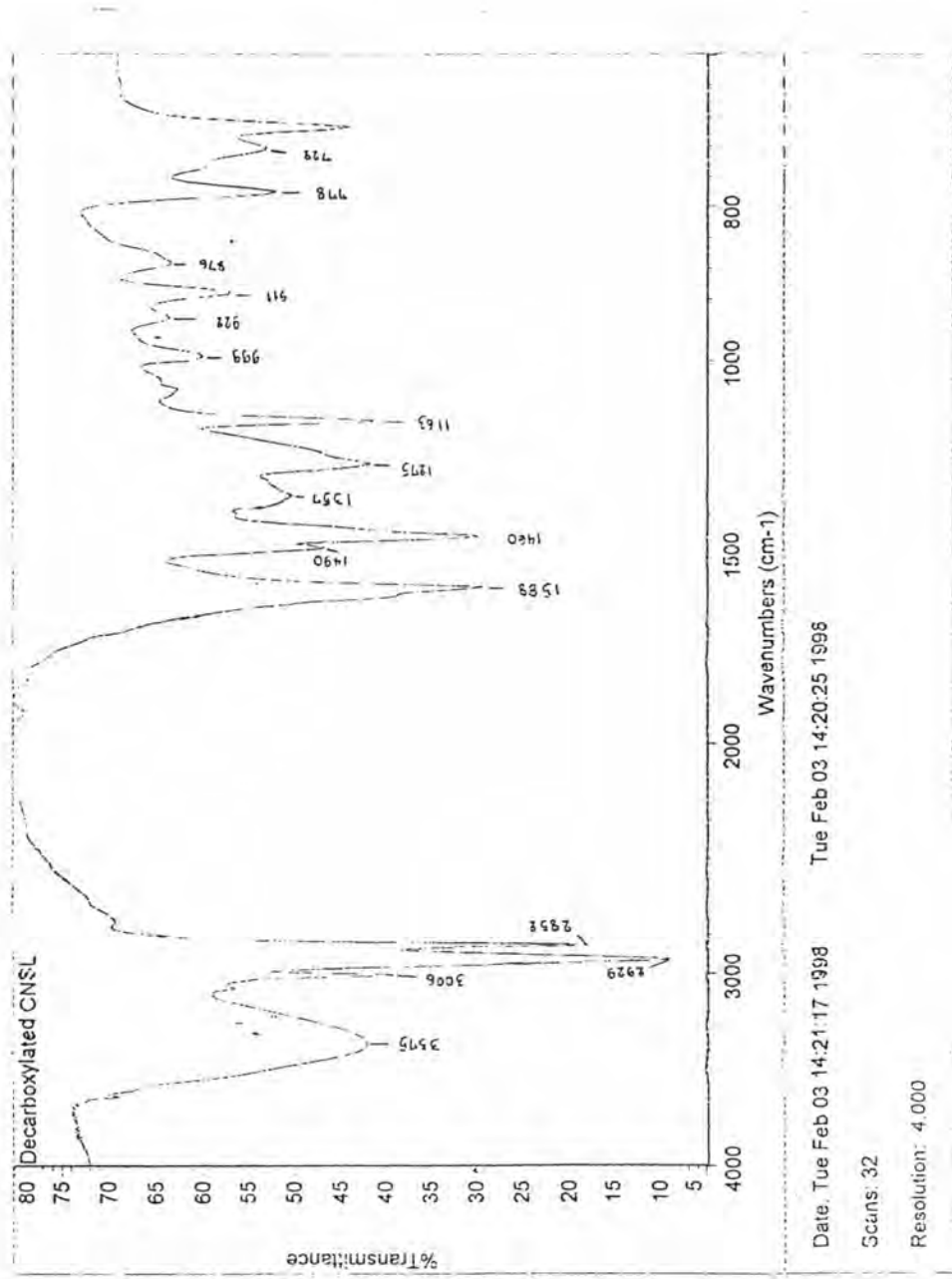


Figure 4. IR spectrum of decarboxylated CNSL

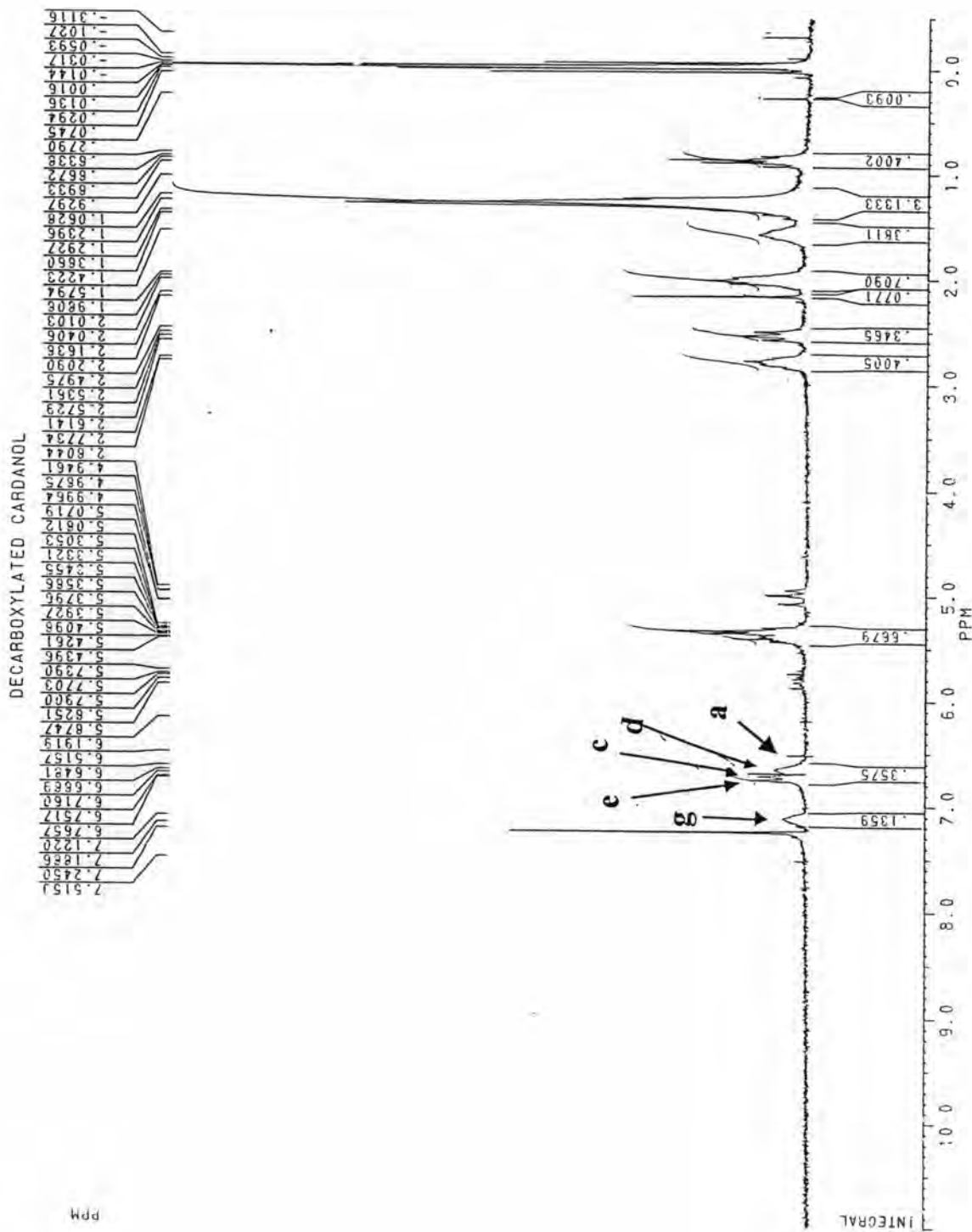


Figure 5. ¹H-NMR spectrum of decarboxylated CNSL

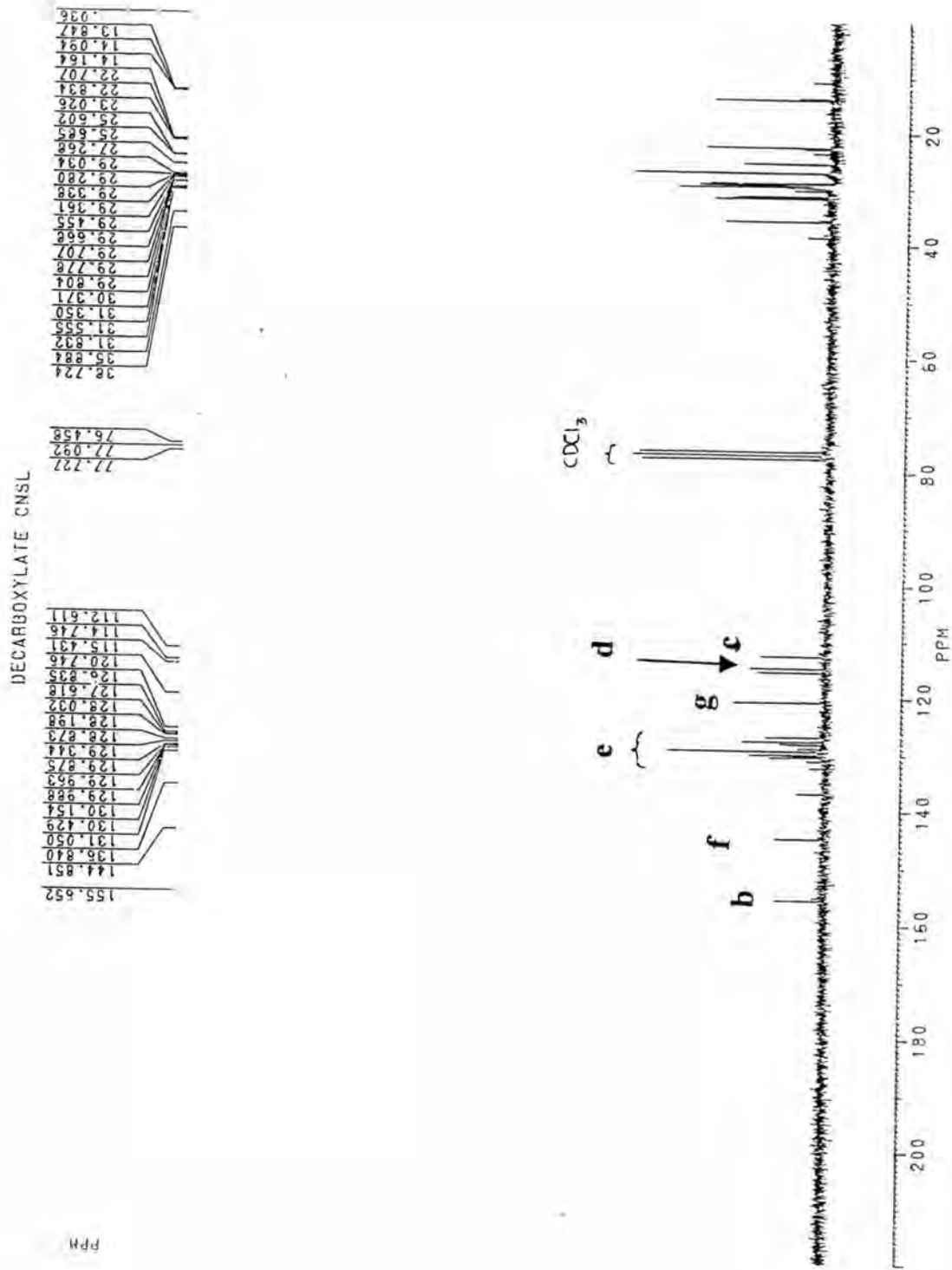


Figure 6. ¹³C-NMR spectrum of decarboxylated CNSL

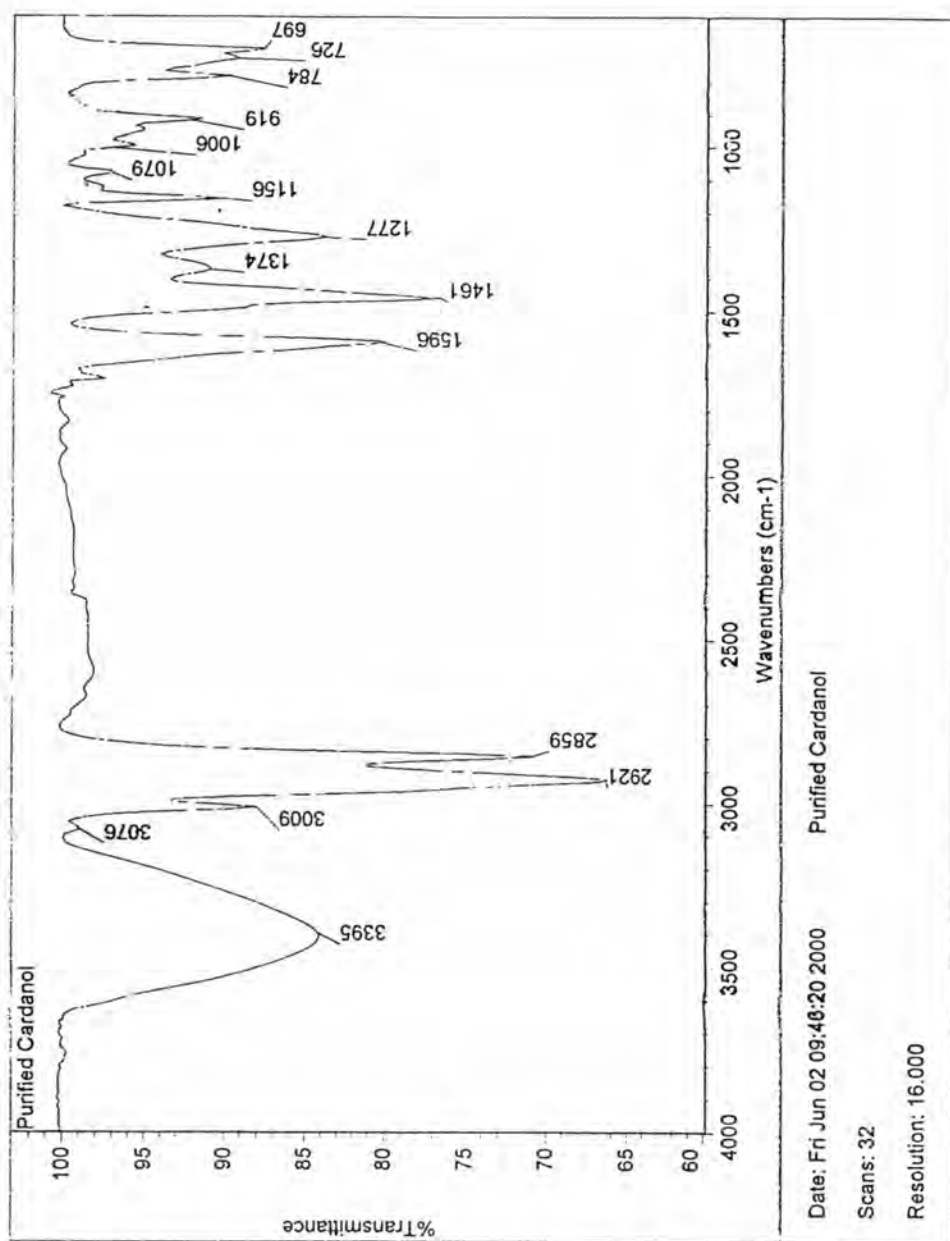


Figure 7. IR spectrum of cardanol

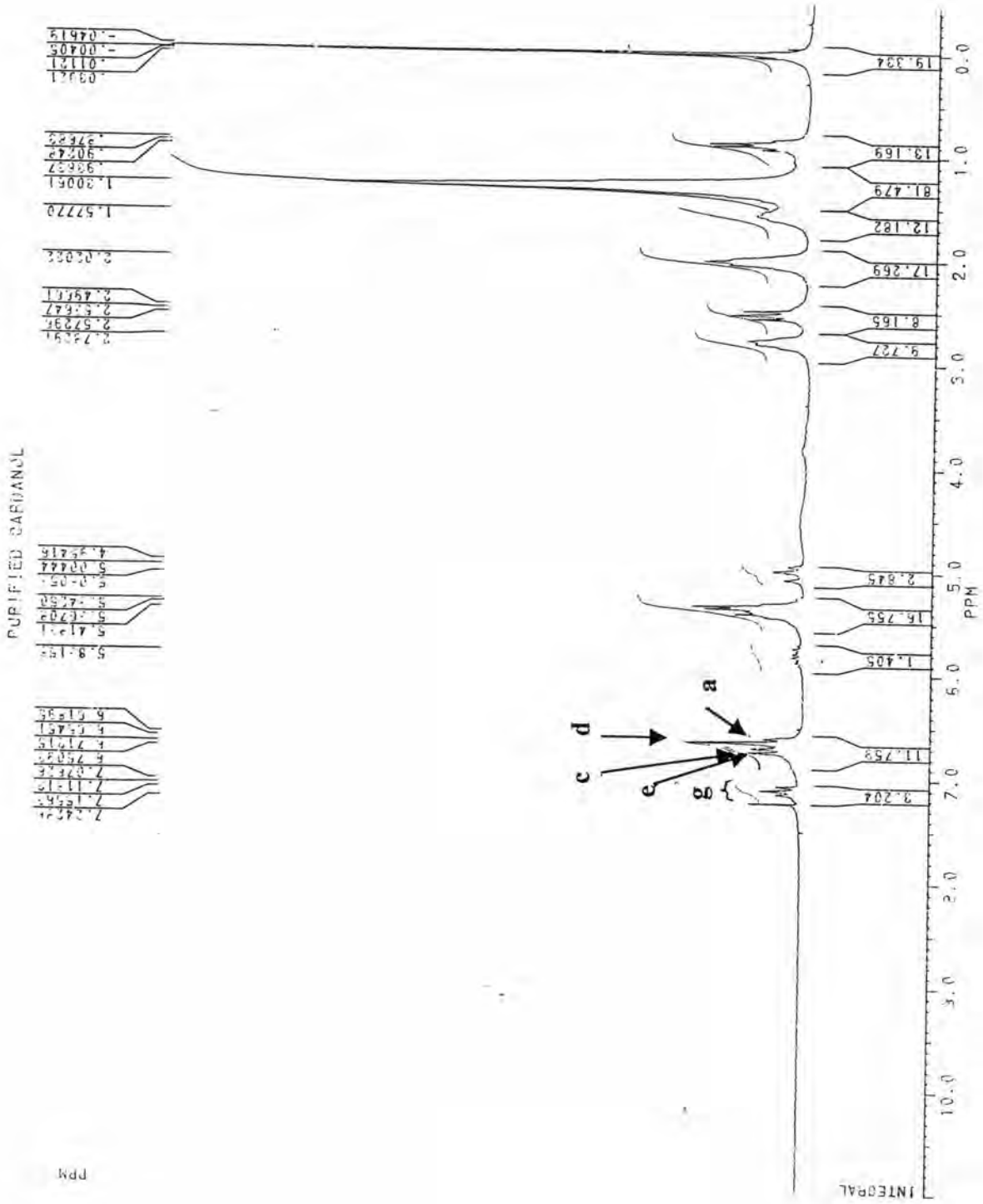


Figure 8. ¹H-NMR spectrum of cardanol

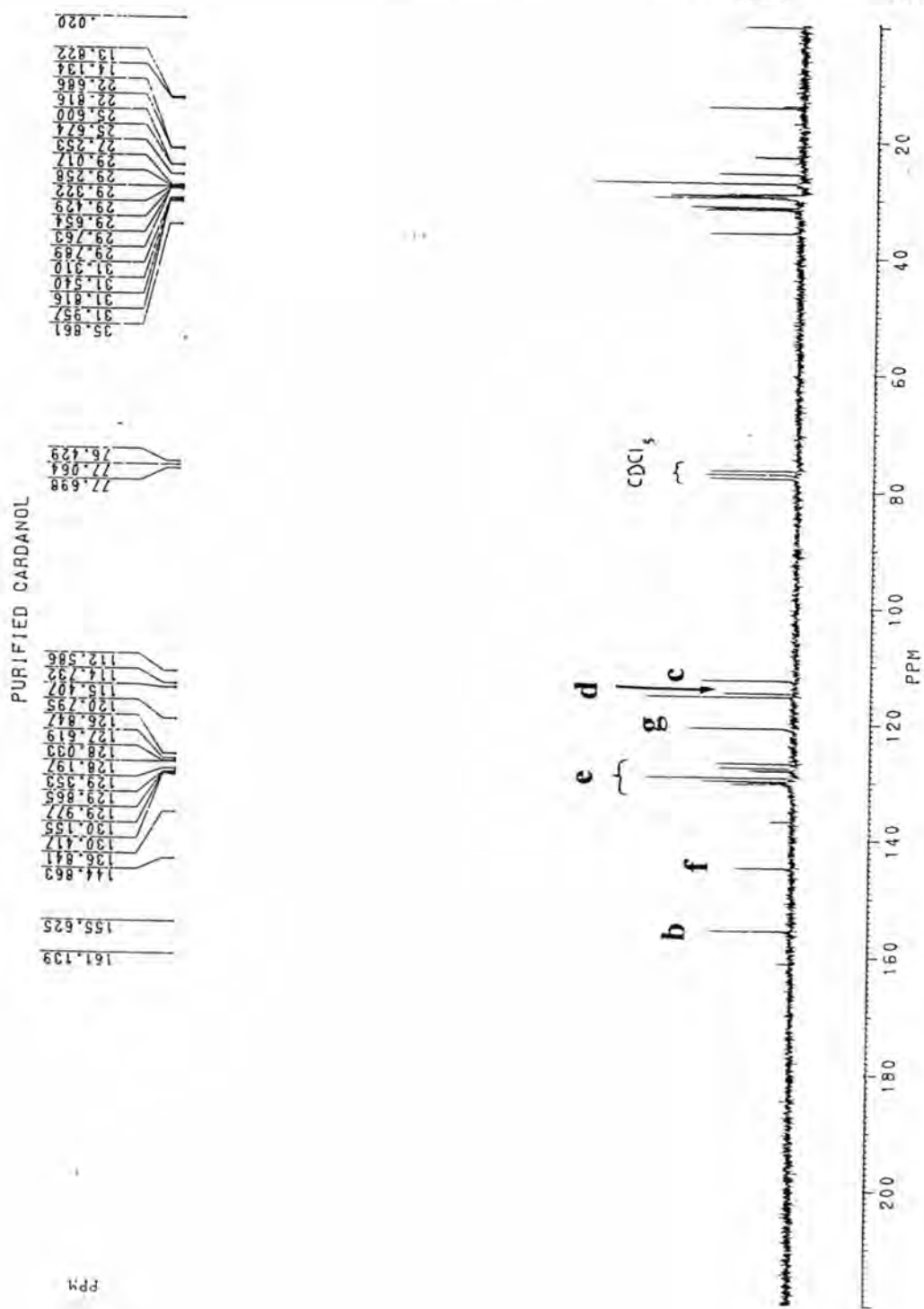


Figure 9. ¹³C-NMR spectrum of cardanol

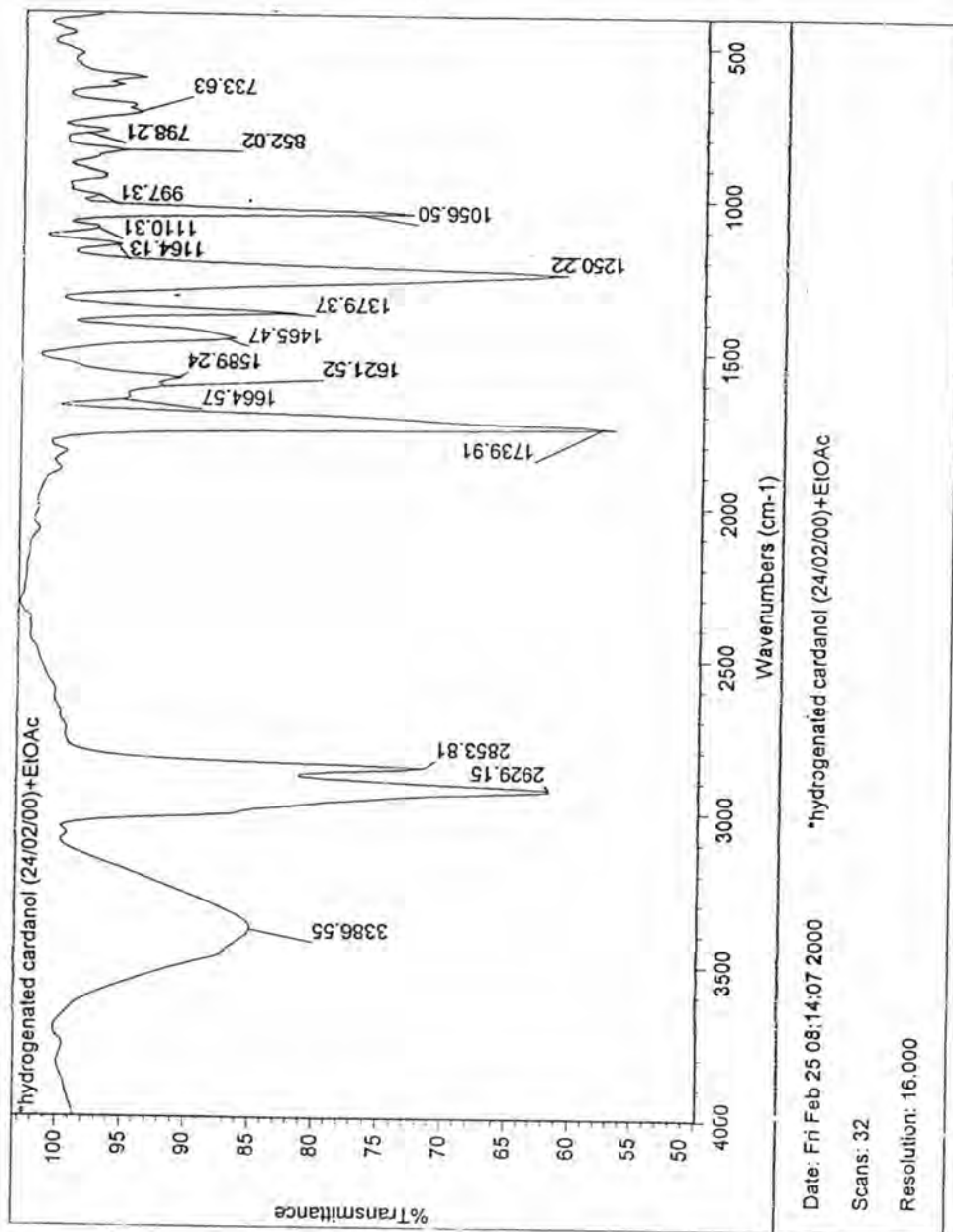


Figure 10. IR spectrum of hydrogenated cardanol

HYDROGENATED CARDANOL + ETHYL ACETATE (20/08/00)

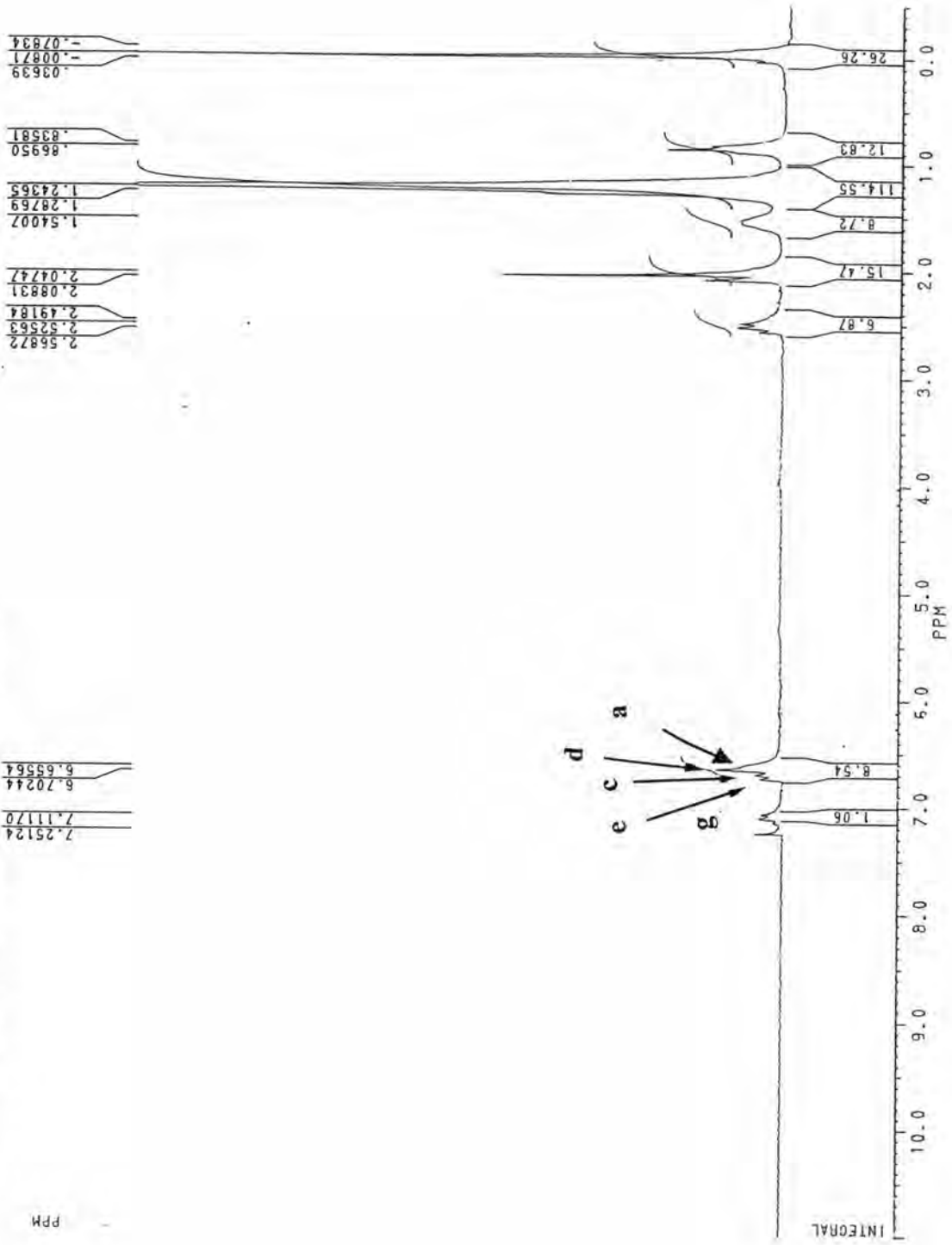


Figure 11. ¹H-NMR spectrum of hydrogenated cardanol

HYDROGENATED CARDANUL + ETHYL ACETATE (20/02/00)

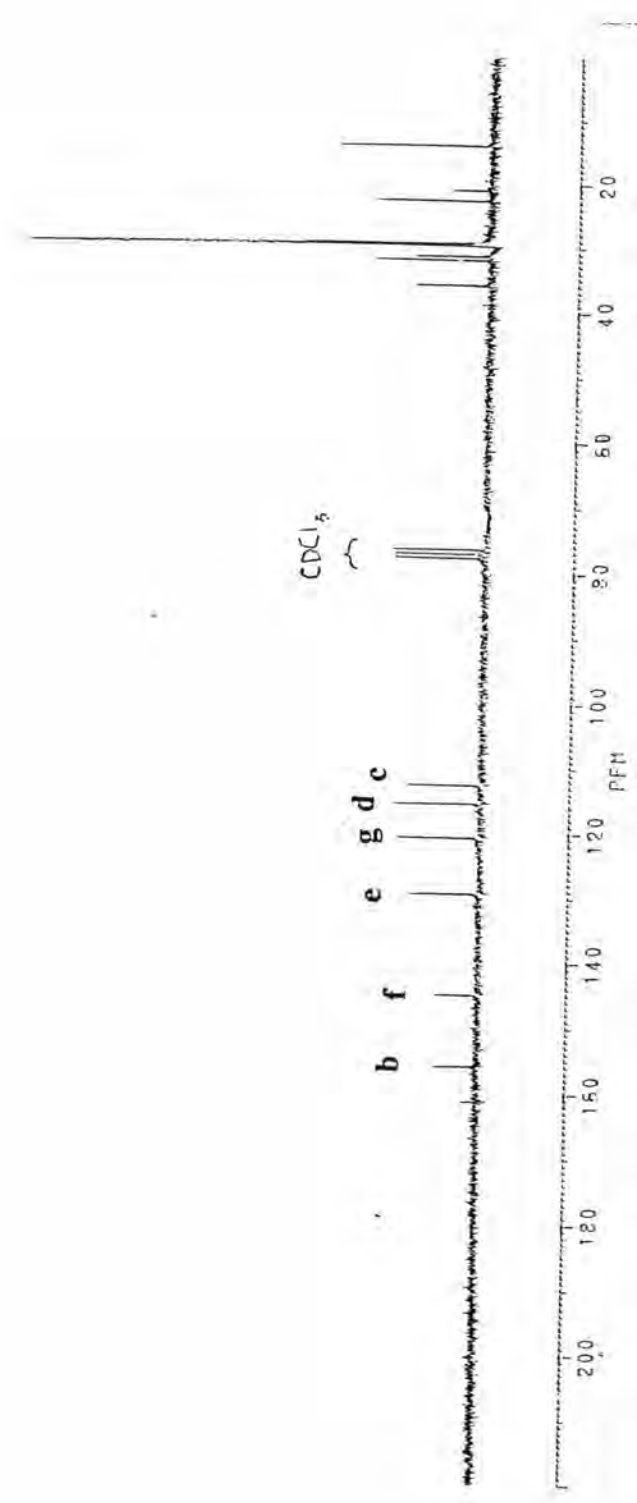
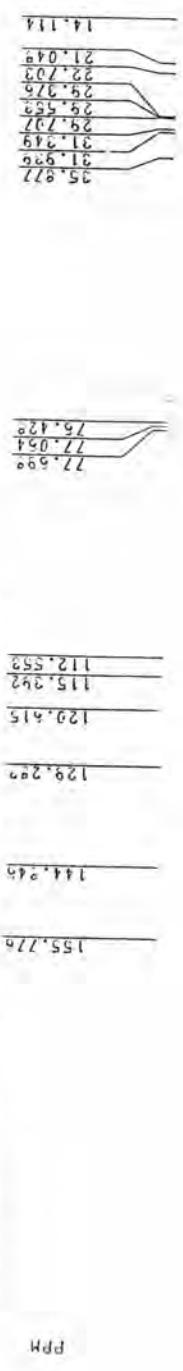


Figure 12. ¹³C-NMR spectrum of hydrogenated cardanol

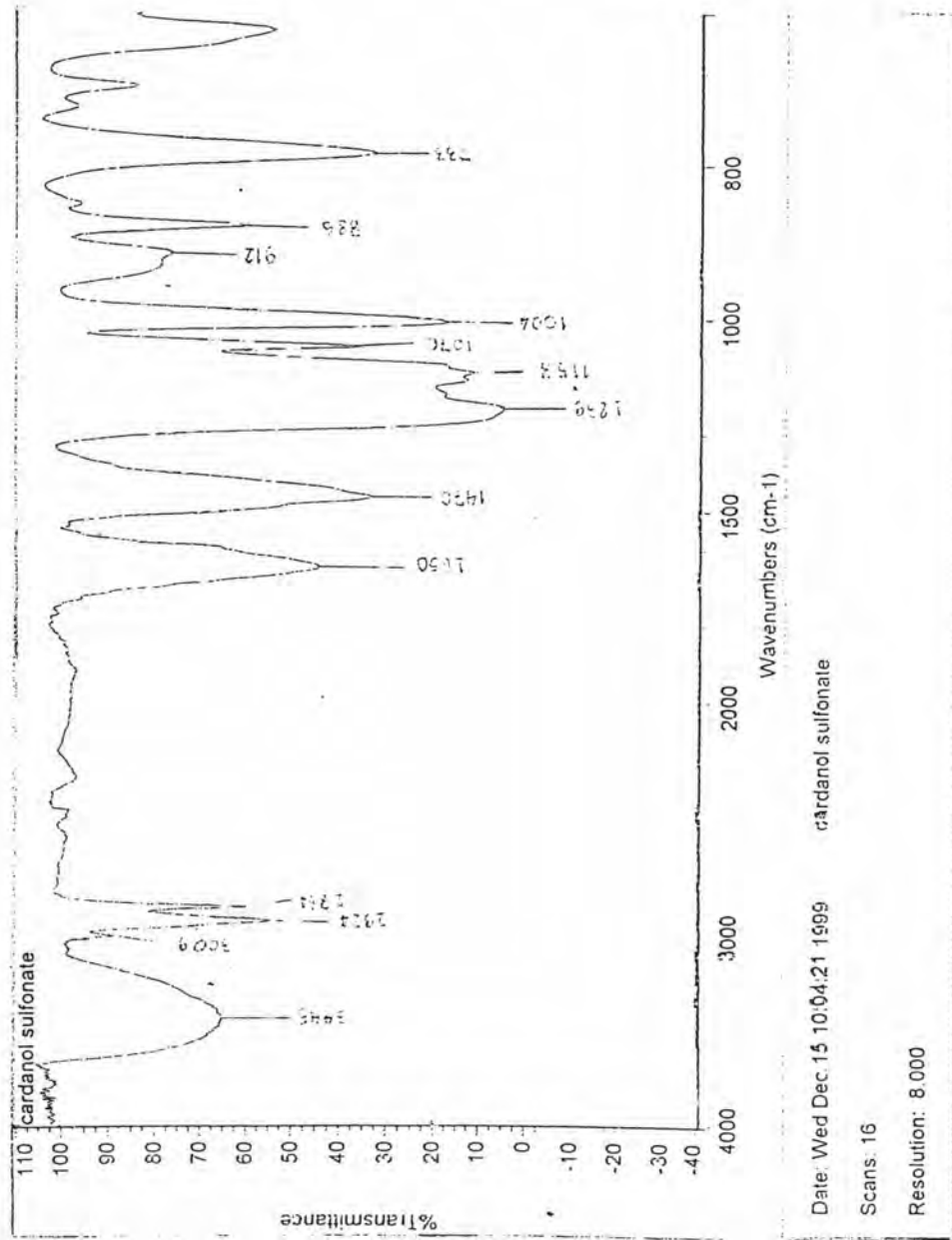


Figure 13. IR spectrum of cardanol sulfonate

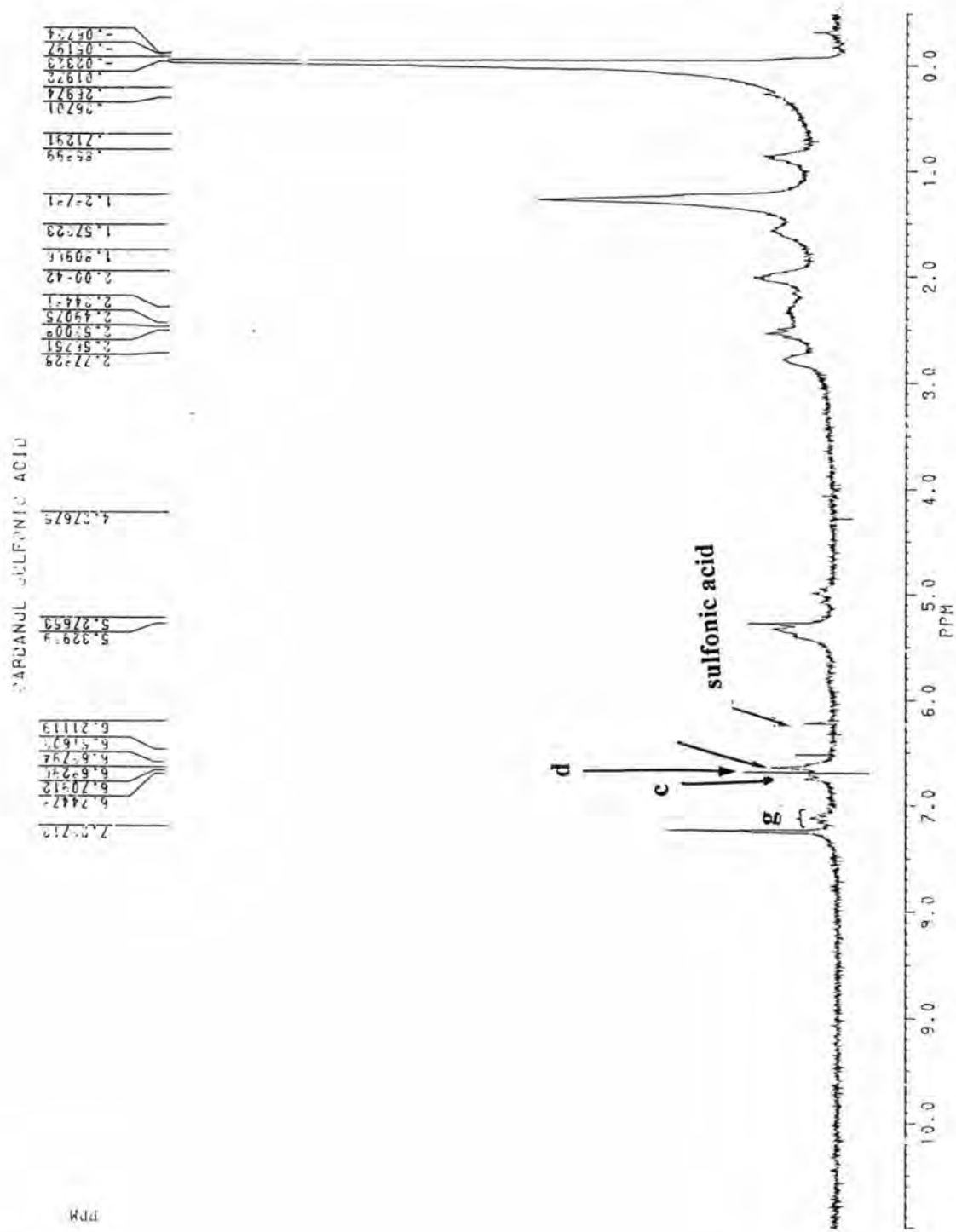


Figure 14. ¹H-NMR spectrum of cardanol sulfonate

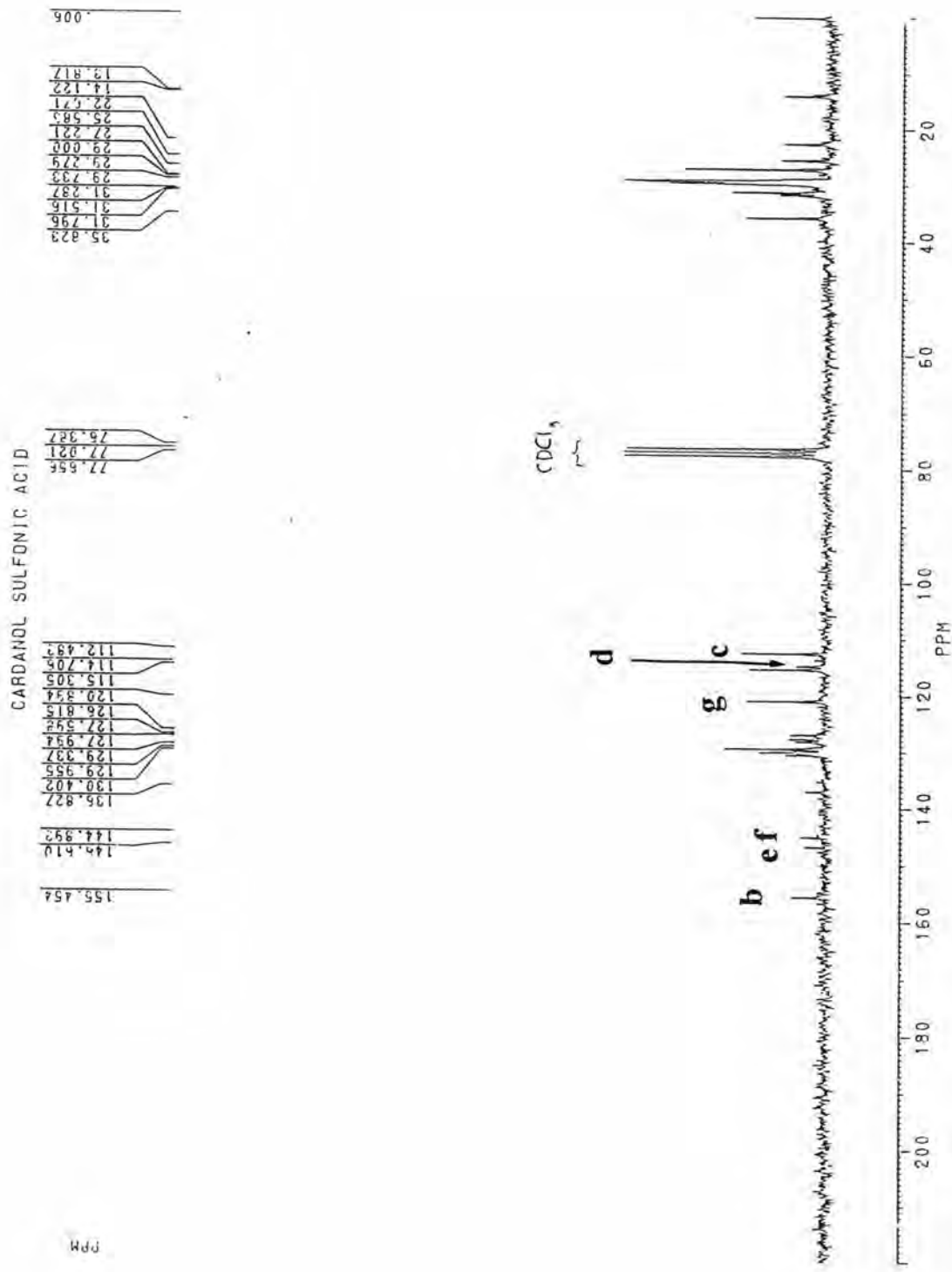


Figure 15. ¹³C-NMR spectrum of cardanol sulfonate

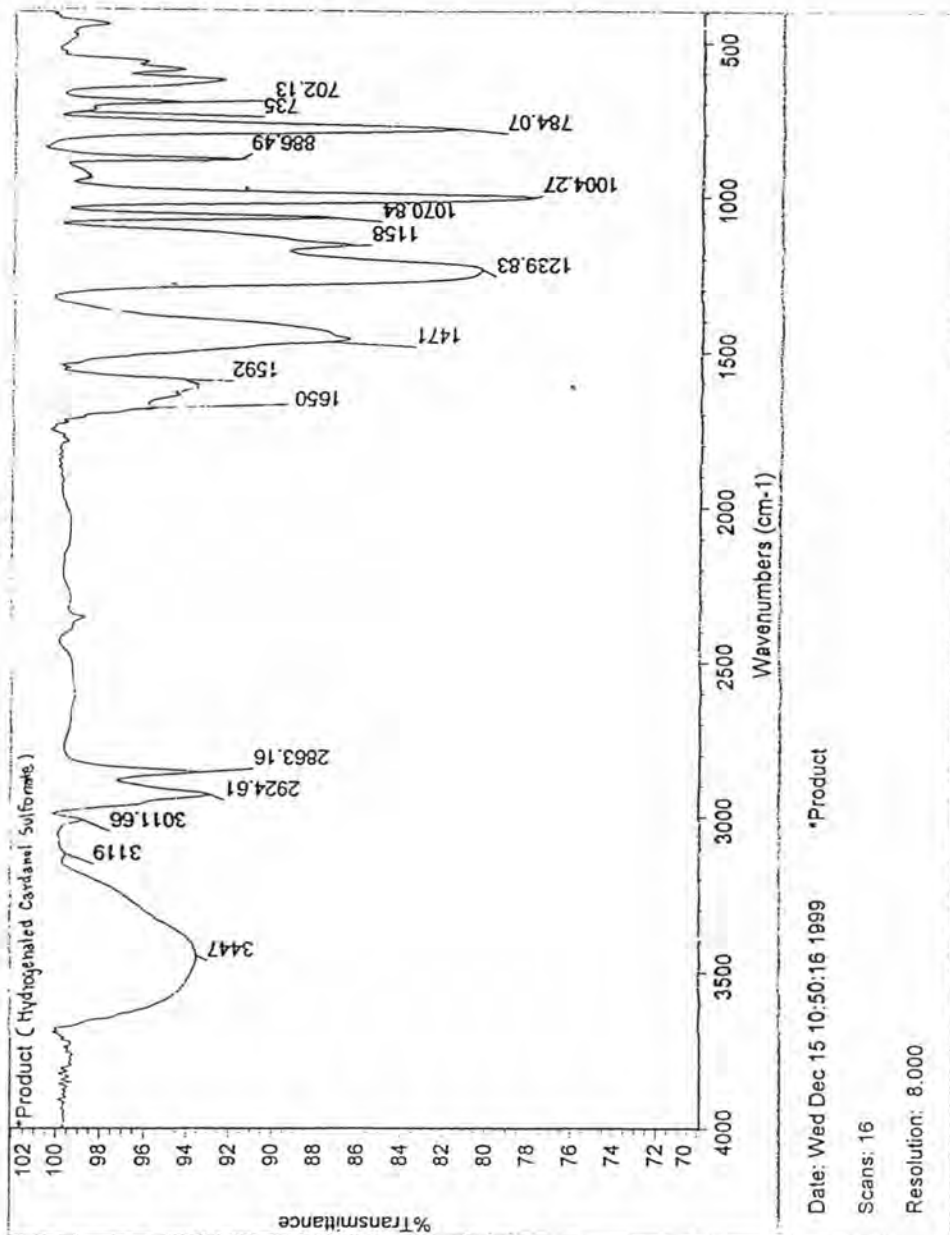


Figure 16. IR spectrum of hydrogenated cardanol sulfonate

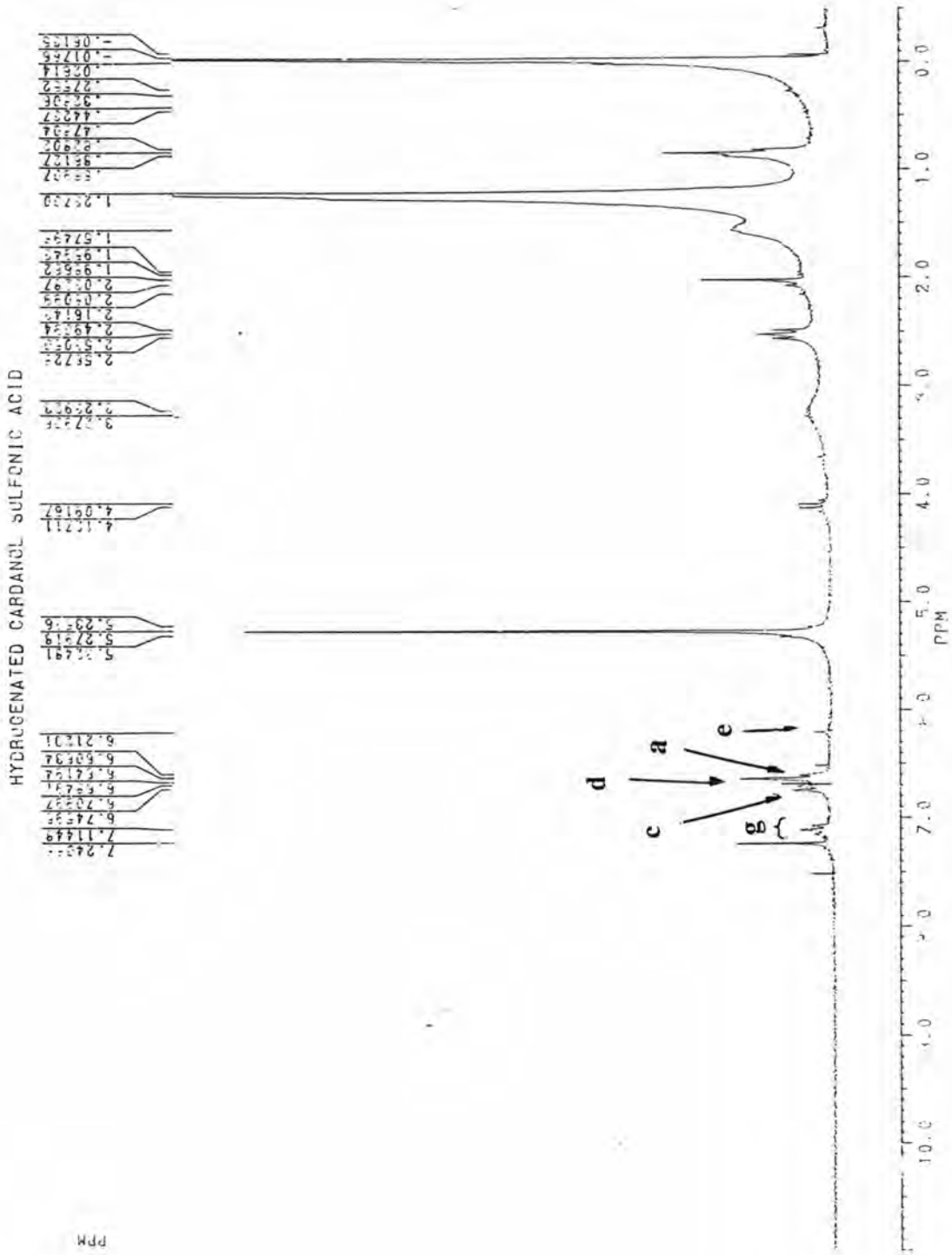


Figure 17. ¹H-NMR spectrum of hydrogenated cardanol sulfonate

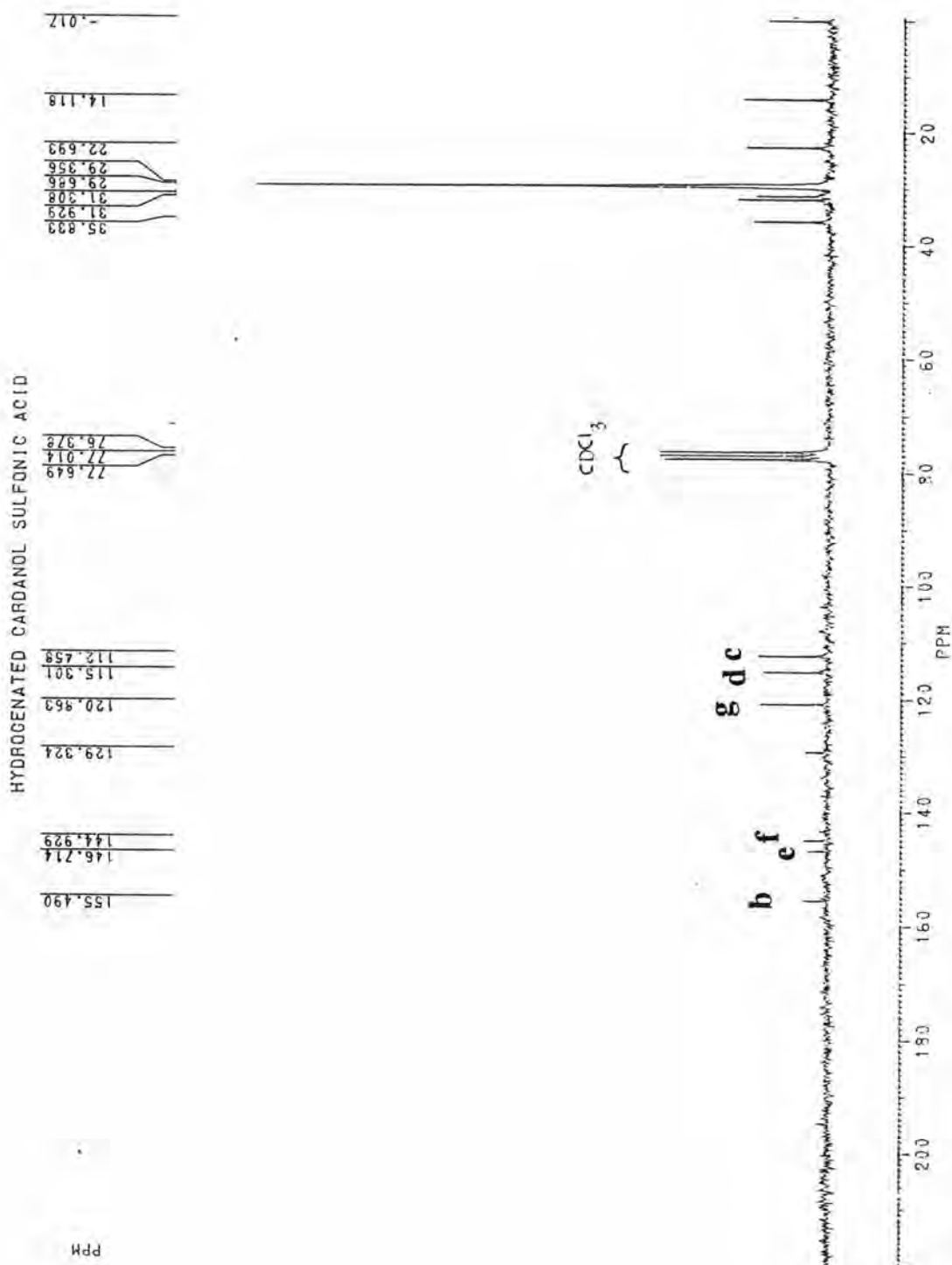


Figure 18. ¹³C-NMR spectrum of hydrogenated cardanol sulfonate

APPENDIX B**Table.1 Surface tension of dodecylbenzene sulfonate**

% w/v	concentration	log C	surface tension (mN/m)
0	0	-	68.00
0.5	0.0143	-1.845	32.50
1.0	0.0288	-1.541	31.75
2.0	0.0574	-1.241	31.00
4.0	0.1148	-0.940	30.75
6.0	0.1722	-0.764	30.00
8.0	0.2296	-0.639	29.25
10.0	0.2870	-0.542	28.50
15.0	0.4304	-0.366	27.75
20.0	0.5739	-0.241	28.00
25.0	0.7174	-0.144	28.00
30.0	0.8609	-0.065	28.00

Table b.2 Surface tension of purified cardanol sulfonate

% w/v	concentration	log C	surface tension (mN/m)
0	0	-	68.00
0.5	0.0124	-1.907	38.75
1.0	0.0249	-1.604	36.50
2.0	0.0498	-1.303	34.25
4.0	0.0995	-1.002	32.75
6.0	0.1493	-0.826	32.75
8.0	0.1990	-0.701	32.00
10.0	0.2488	-0.604	32.00
15.0	0.3431	-0.428	32.00
20.0	0.4975	-0.303	32.25
25.0	0.6219	-0.206	32.25
30.0	0.7463	-0.127	32.00

Table b.3 Surface tension of hydrogenated cardanol

% w/v	concentration	log C	surface tension (mN/m)
0	0	-	68.00
0.5	0.0124	-1.907	37.25
1.0	0.0249	-1.604	34.50
2.0	0.0498	-1.303	33.25
4.0	0.0995	-1.002	32.50
6.0	0.1493	-0.826	32.25
8.0	0.1990	-0.701	32.00
10.0	0.2488	-0.604	32.25
15.0	0.3431	-0.428	32.00
20.0	0.4975	-0.303	32.00
25.0	0.6219	-0.206	32.00
30.0	0.7463	-0.127	32.00

Table b.4 Reflectance

Before coating with clay soil

Reflectance = 88.61

Before washing	After washing with Dodecylbenzene Sulfonate	Before washing	After washing with purified cardanol	Before washing	After washing with hydrogenated cardanol
48.28	69.210	47.980	66.330	48.440	68.740
48.39	68.530	49.390	67.330	49.390	68.510
48.44	69.220	47.850	66.650	47.680	68.490
48.27	67.510	49.340	65.520	49.090	68.130
48.81	67.290	48.640	66.350	48.110	68.890
48.33	69.480	48.780	66.940	48.980	68.580
48.34	66.910	48.670	66.910	49.000	68.450
48.00	69.000	48.880	67.070	48.270	68.770
47.47	69.250	48.010	67.240	49.080	67.860
48.92	69.690	49.680	67.140	47.990	67.290
Average 48.325	68.910	48.672	66.748	48.603	67.971

$$\% \text{ Detergency (each detergent)} = \left(\frac{(\text{After washing} - \text{before washing})}{(\text{Before coating with clay soil} - \text{after washing})} \right) \times 100$$

$$\% \text{ Detergency} = \left(\frac{\% \text{ Detergency of synthesis detergent}}{\% \text{ Detergency of dodecylbenzene sulfonate}} \right) \times 100$$

Table b.5. % Detergency of dodecylbenzene sulfonate, cardanol sulfonate and hydrogenated cardanol sulfonate

	Dodecylbenzene sulfonate	Cardanol sulfonate	Hydrogenated cardanol sulfonate
% detergency	99.73	87.58	93.84

VITA

Miss. Pitima Suwanakarn was born on November 9, 1976. She received her bachelor's Degree of Science in Chemistry from Department Chemistry, Faculty of Science, Mahidol University in 1998. She began her Master study in the Program of the Petrochemical and Polymer Science. Faculty of Science, Chulalongkorn University, in 1998 and completed the program in 2001.