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APPENDIX

PALM OIL

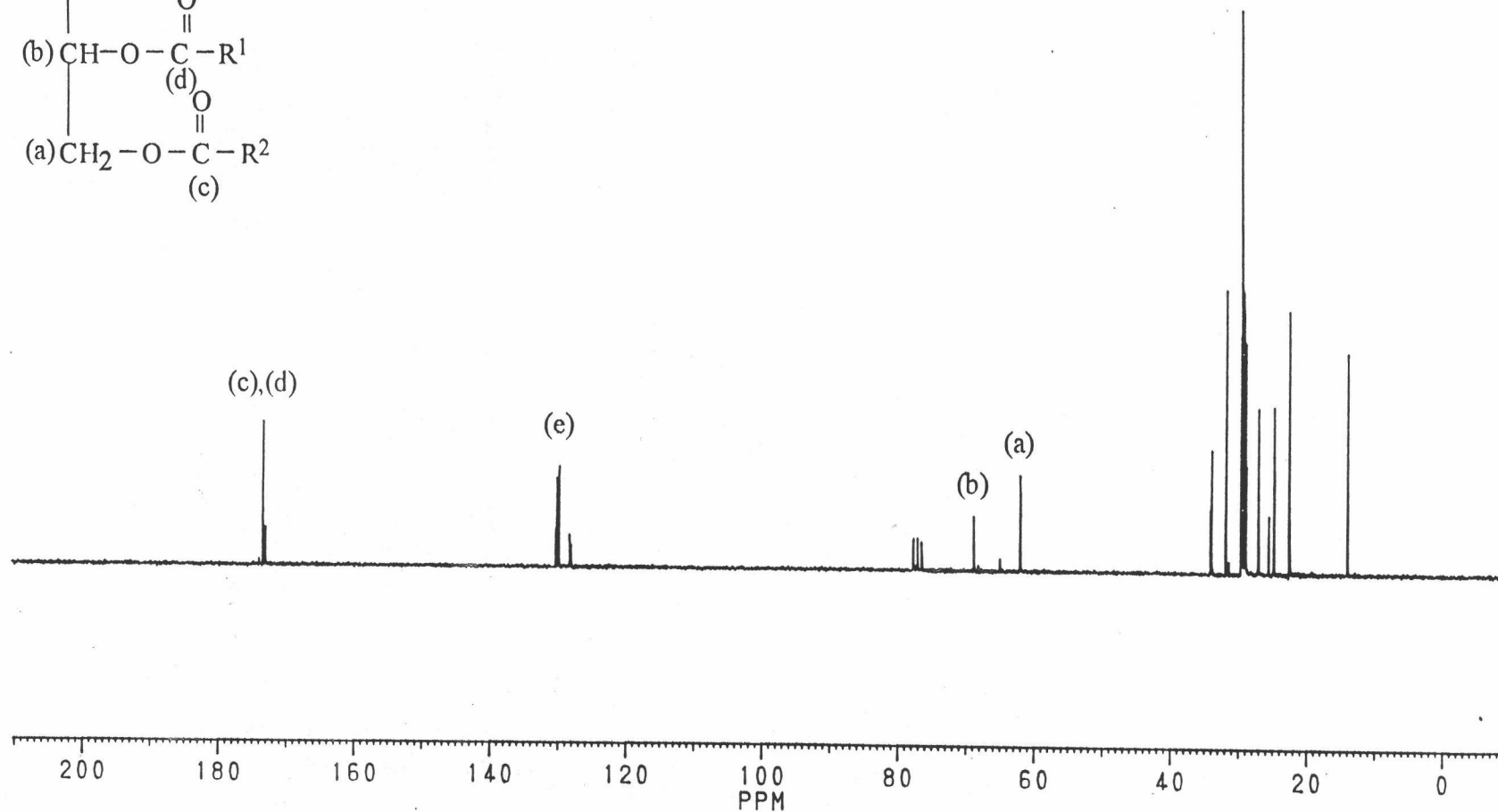
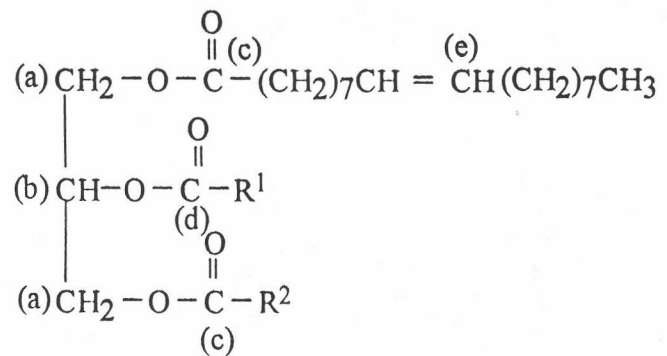


Figure A1 : ^{13}C NMR (CDCl_3) spectrum of palm oil

1-BUTANOL

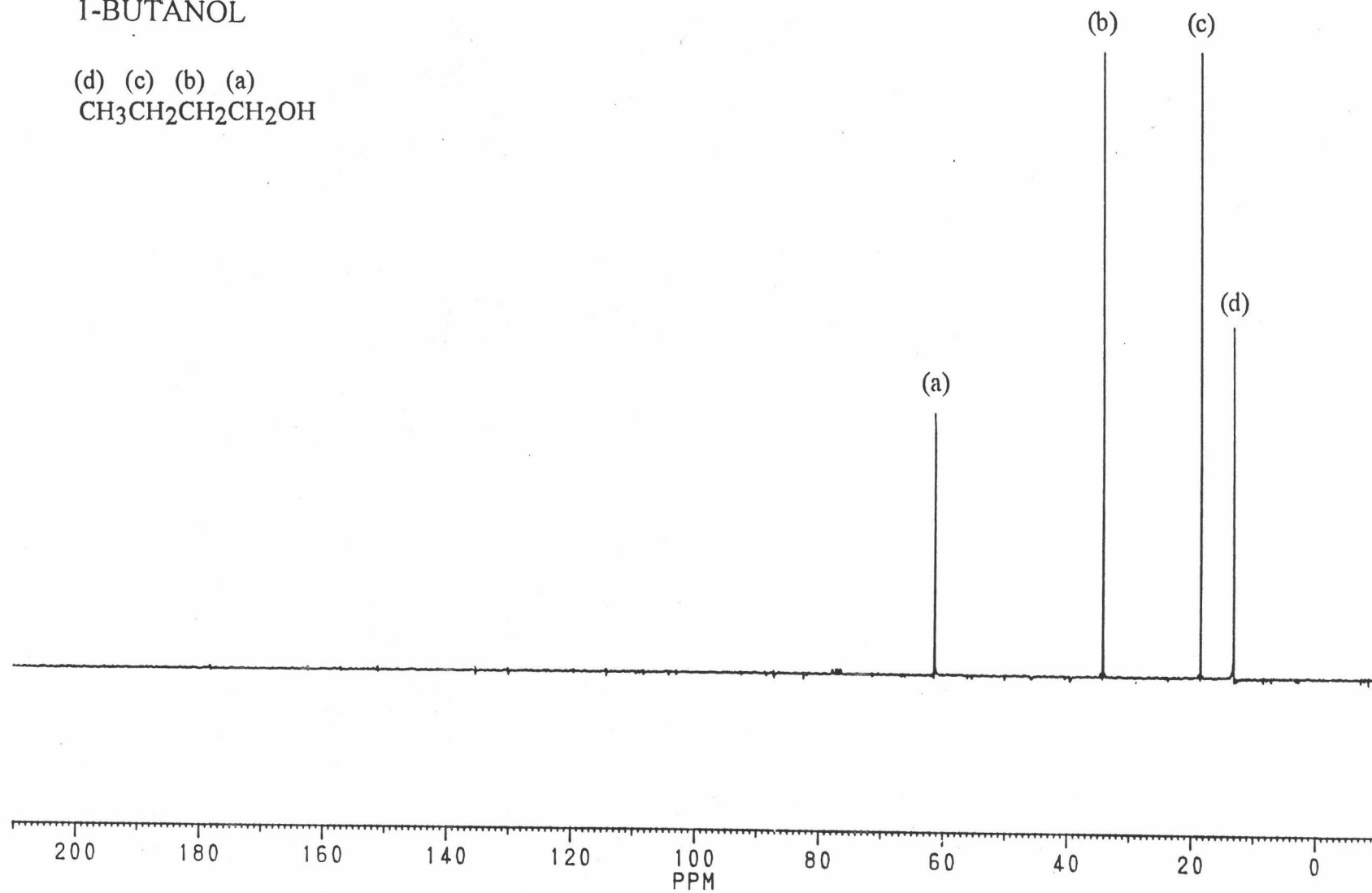
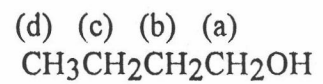


Figure A2 : ^{13}C NMR (CDCl_3) spectrum of 1-butanol

HEXANOL

(f) (e) (d) (c) (b) (a)

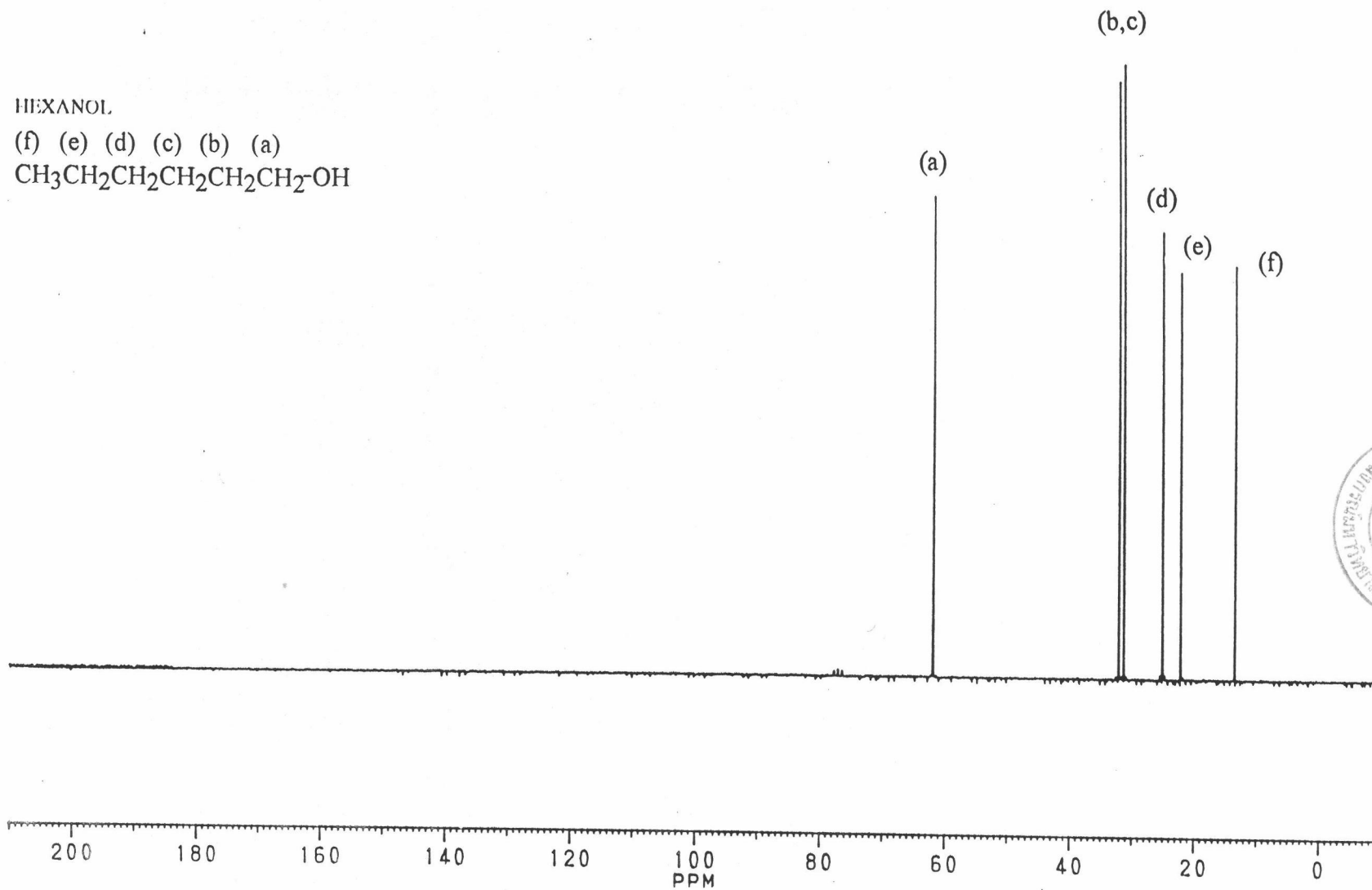
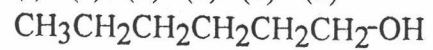


Figure A3 : ^{13}C NMR (CDCl_3) spectrum of 1-hexanol

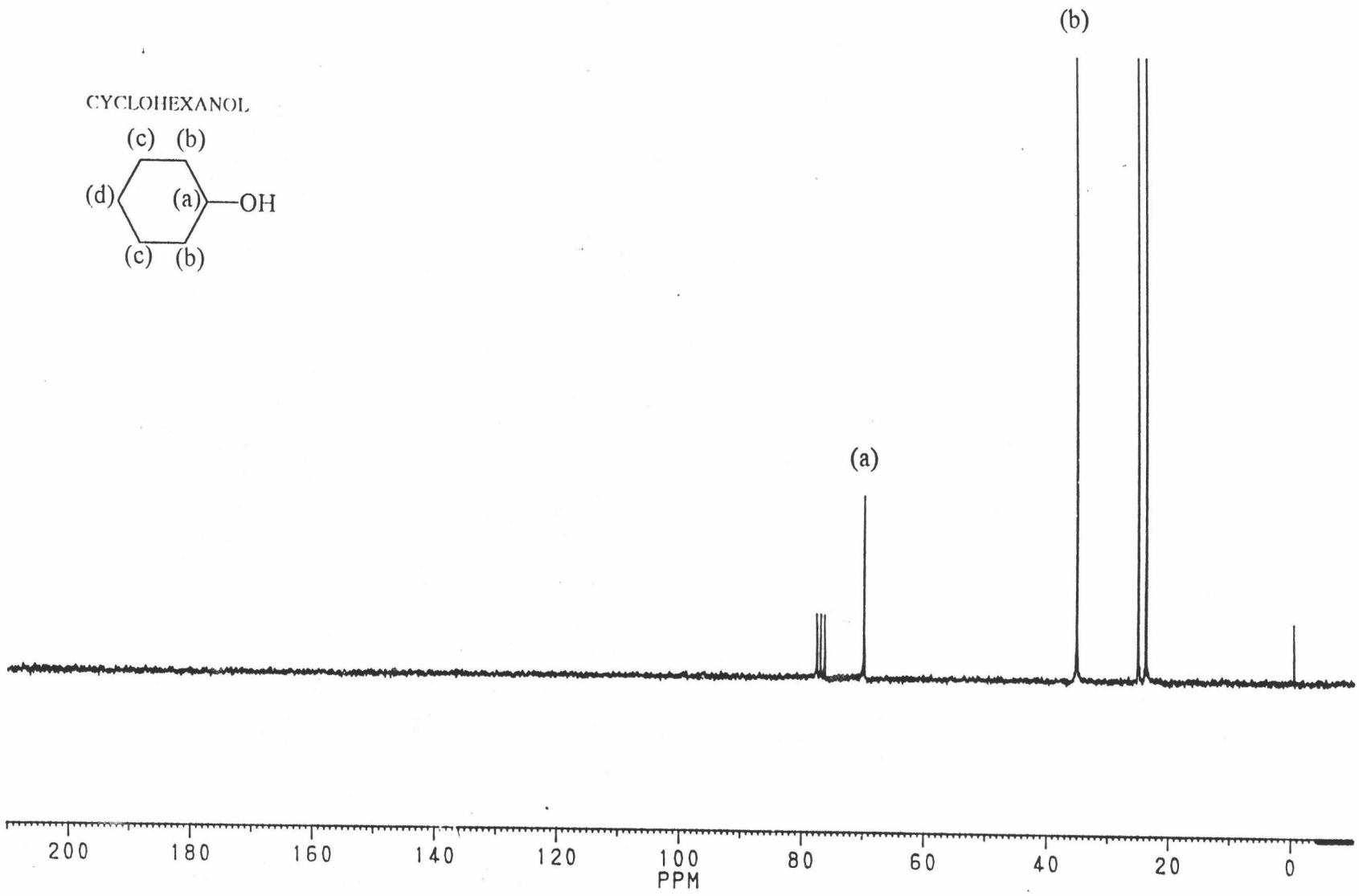


Figure A4 : ^{13}C NMR (CDCl_3) spectrum of cyclohexanol

2-ETHYL-1-HEXANANOL

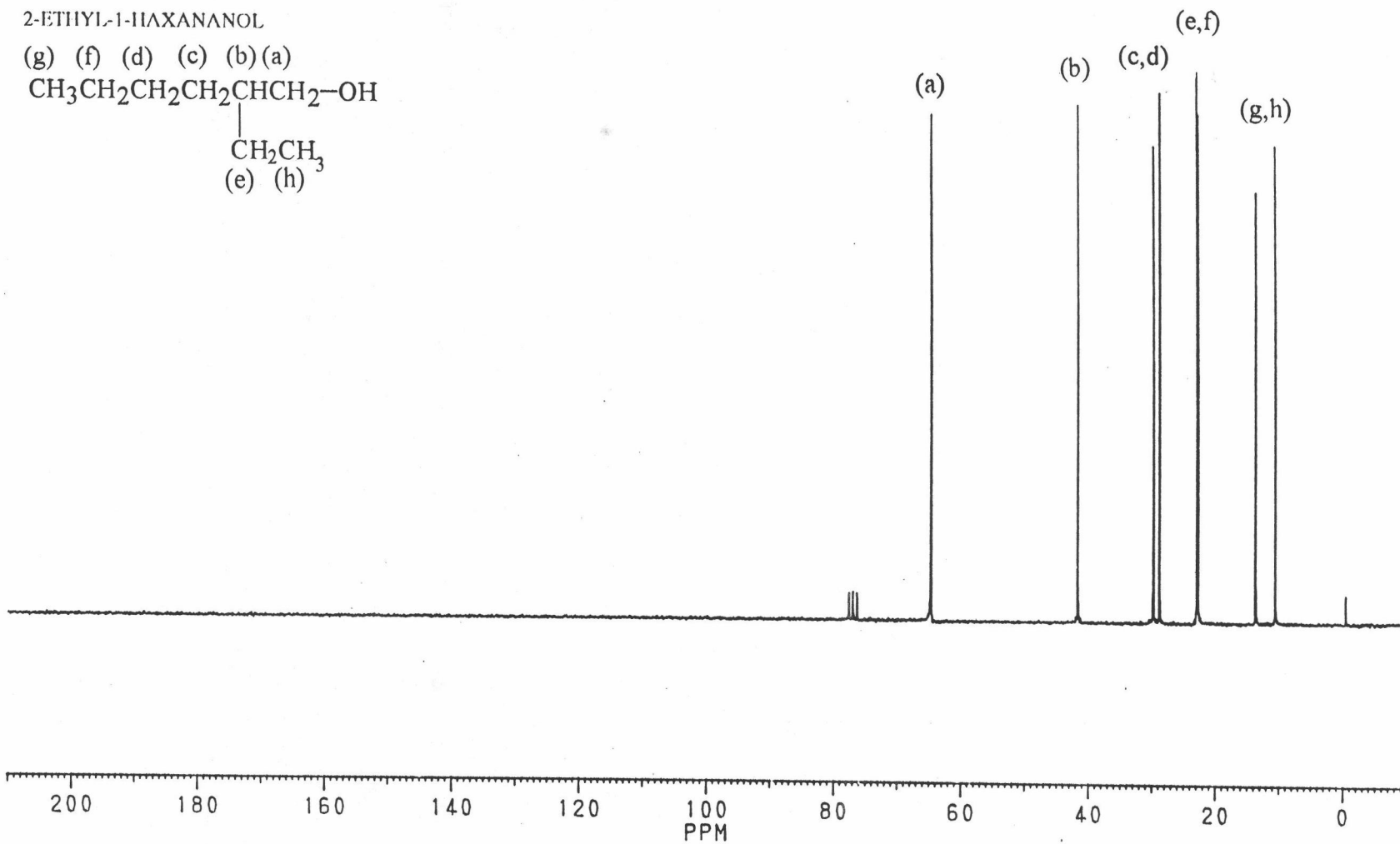
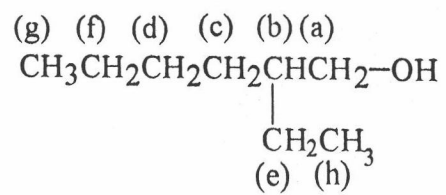


Figure A5 : ¹³C NMR (CDCl₃) spectrum of 2-ethyl-1-hexanol

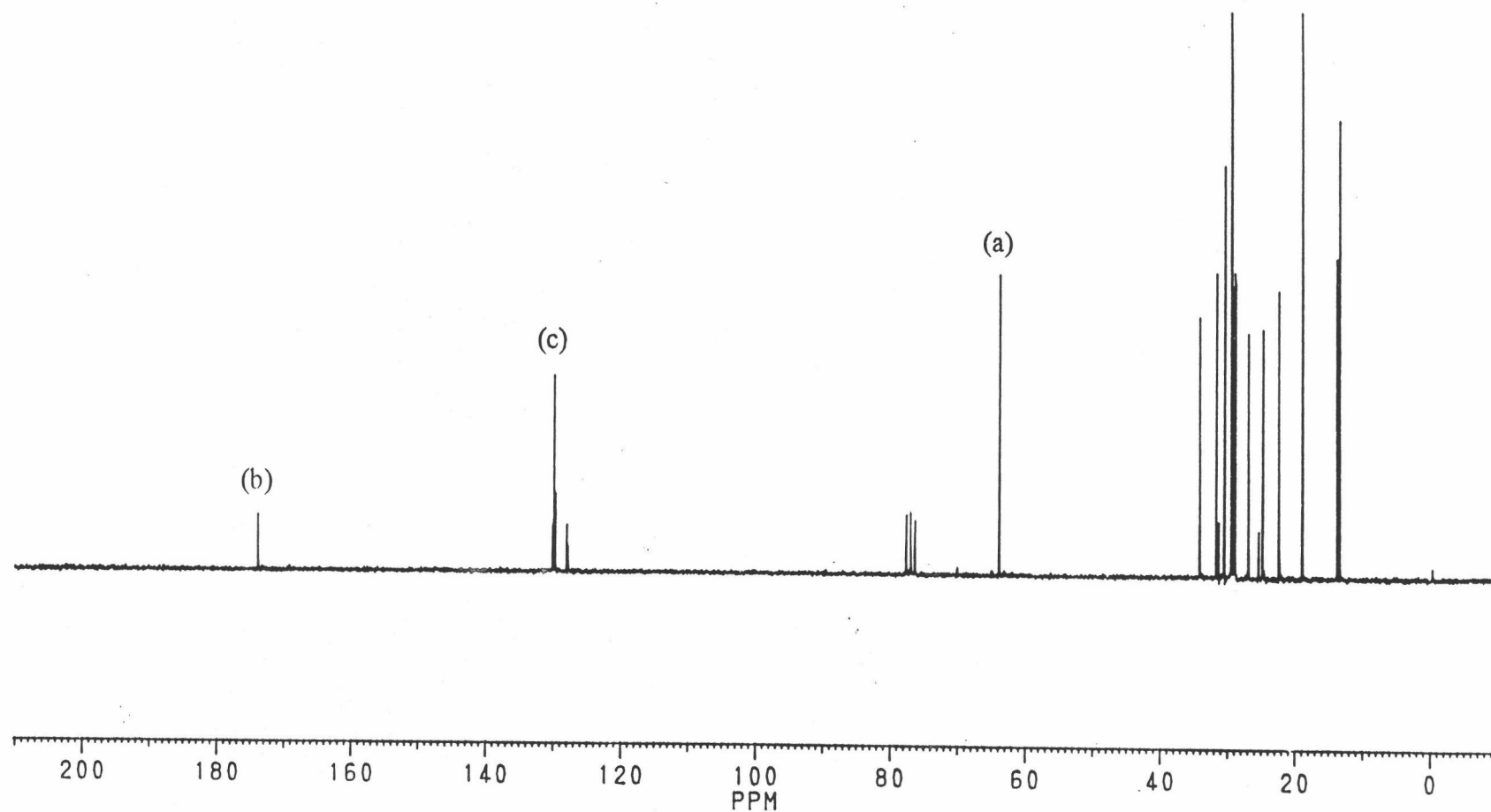
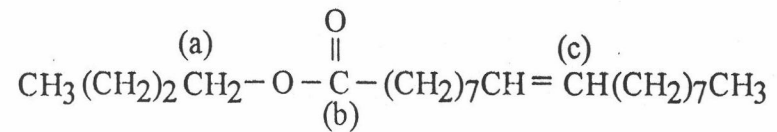


Figure A6 : ^{13}C NMR (CDCl_3) spectrum of monoester obtained from transesterification between palm oil and butanol

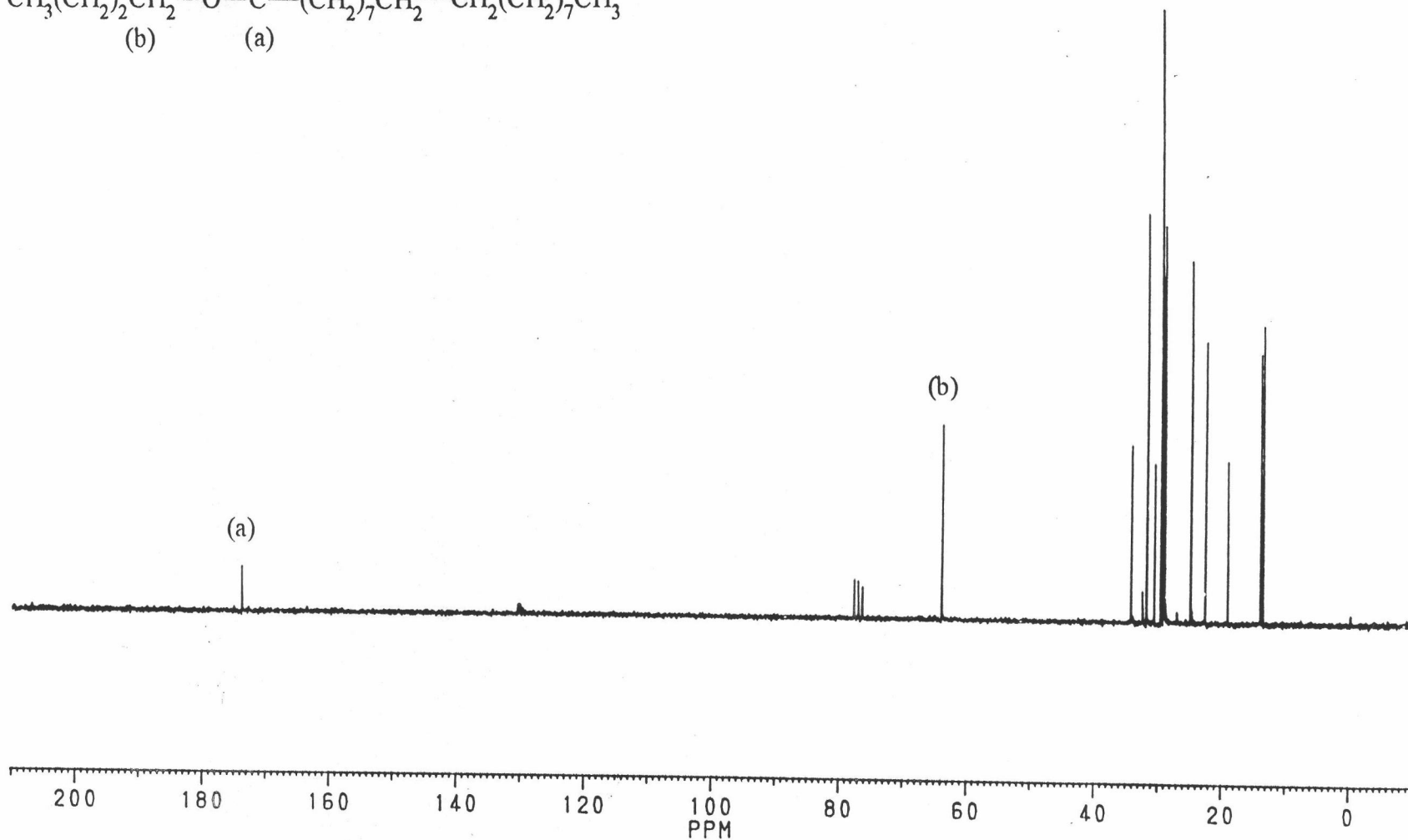
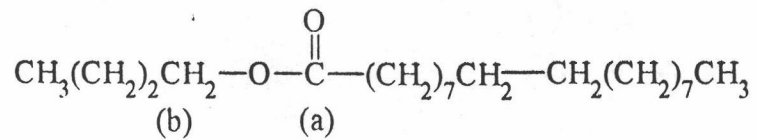


Figure A7 : ^{13}C NMR (CDCl_3) spectrum of monoester obtained from transesterification between palm oil and butanol (after hydrogenation)

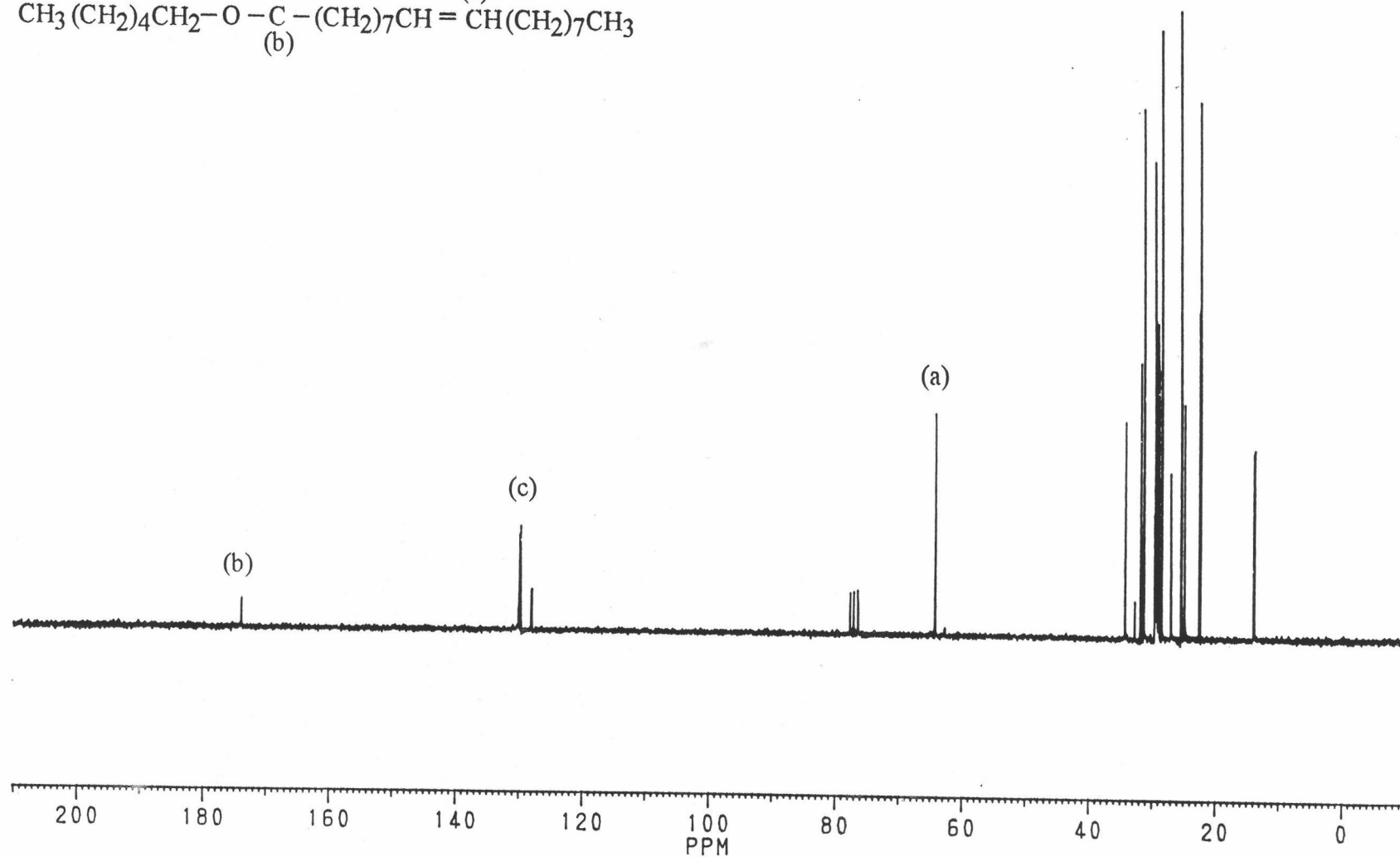
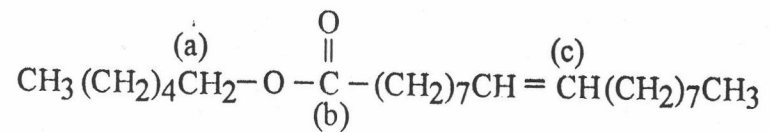


Figure A8 : ^{13}C NMR (CDCl_3) spectrum of monoester obtained from transesterification between palm oil and hexanol

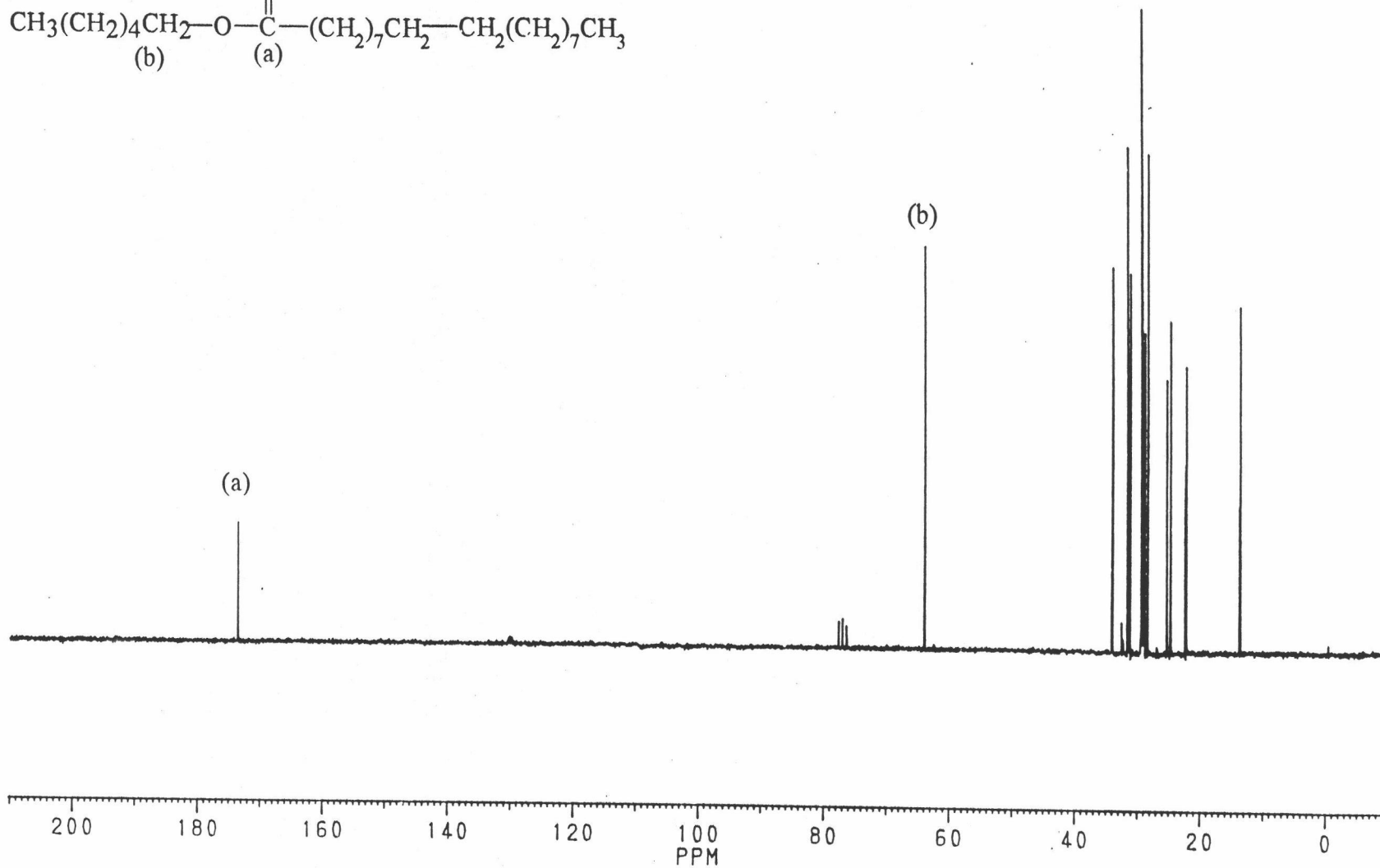
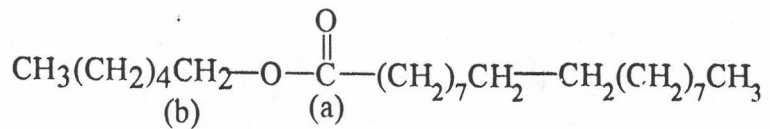


Figure A9 : ^{13}C NMR (CDCl_3) spectrum of monoester obtained from transesterification between palm oil and 1-hexanol (after hydrogenate)

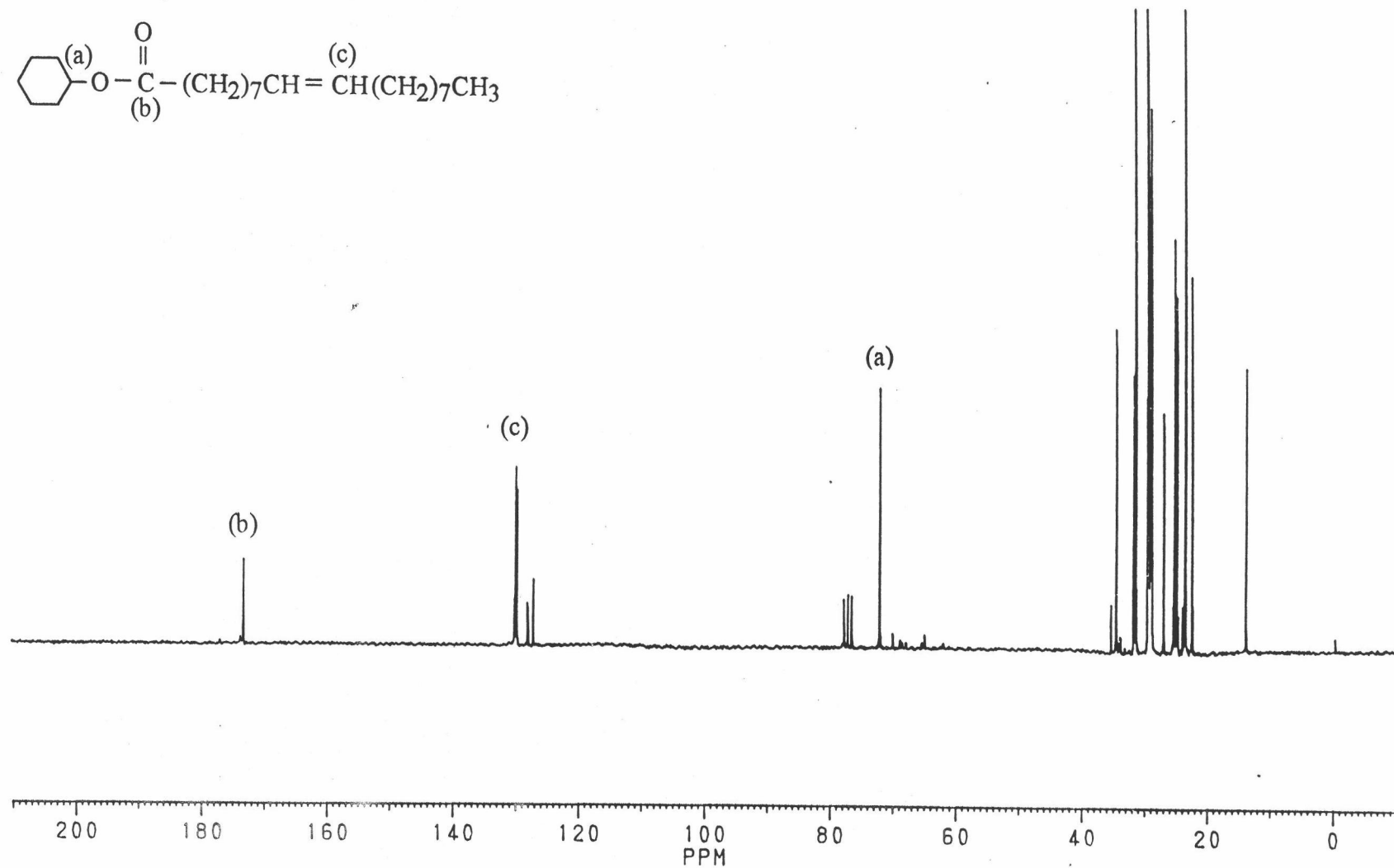
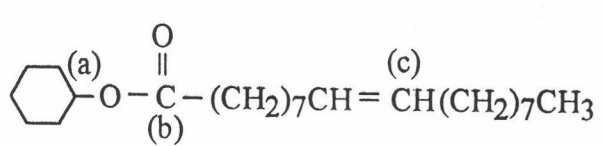


Figure A10 : ^{13}C NMR (CDCl_3) spectrum of monoester obtained from transesterification between palm oil and cyclohexanol

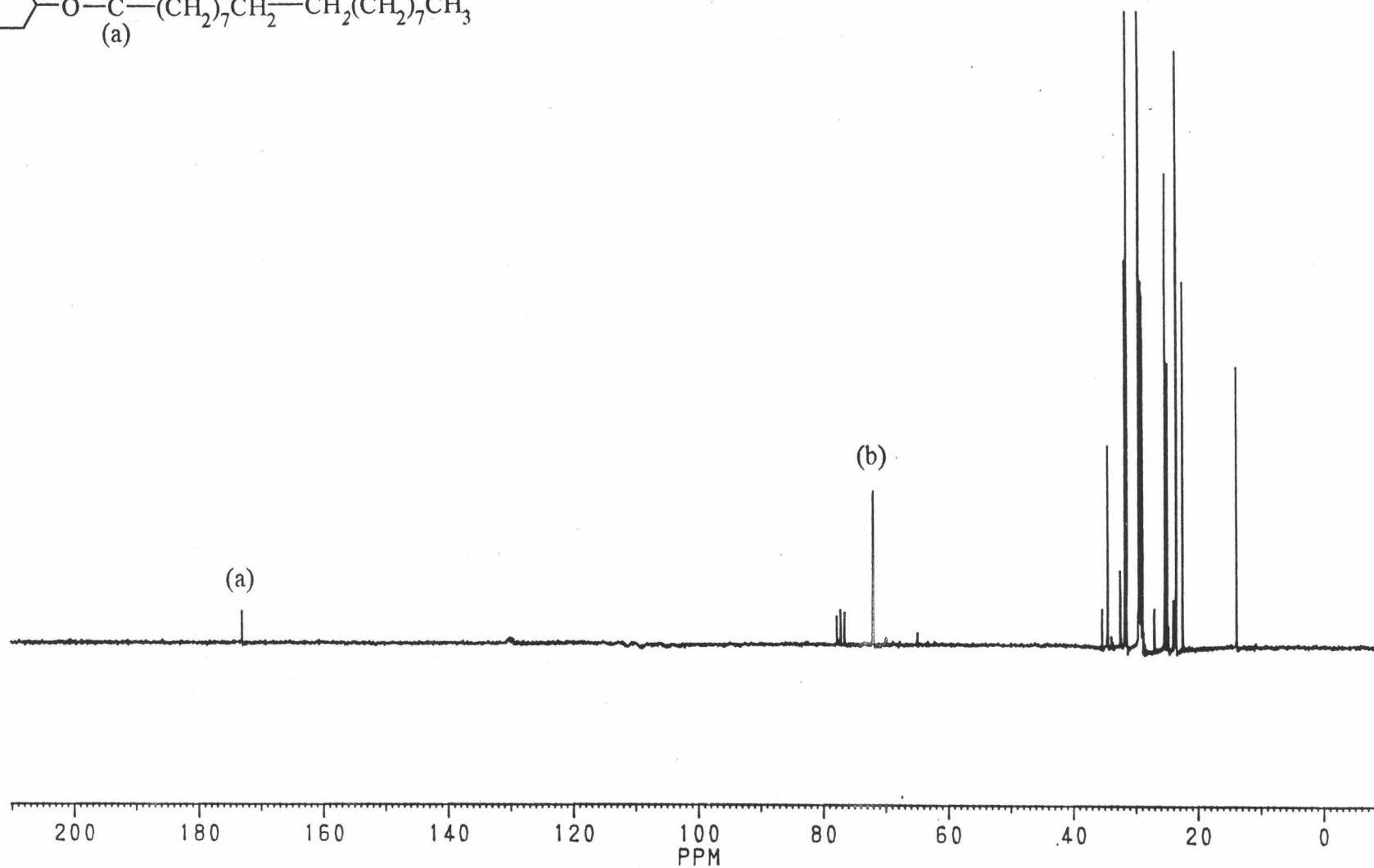
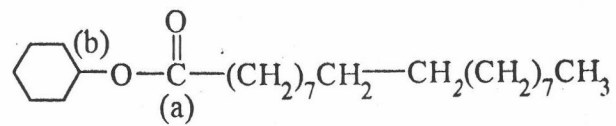


Figure A11 : ^{13}C NMR (CDCl_3) spectrum of monoester obtained from transesterification between palm oil and cyclohexanol (after hydrogenate)

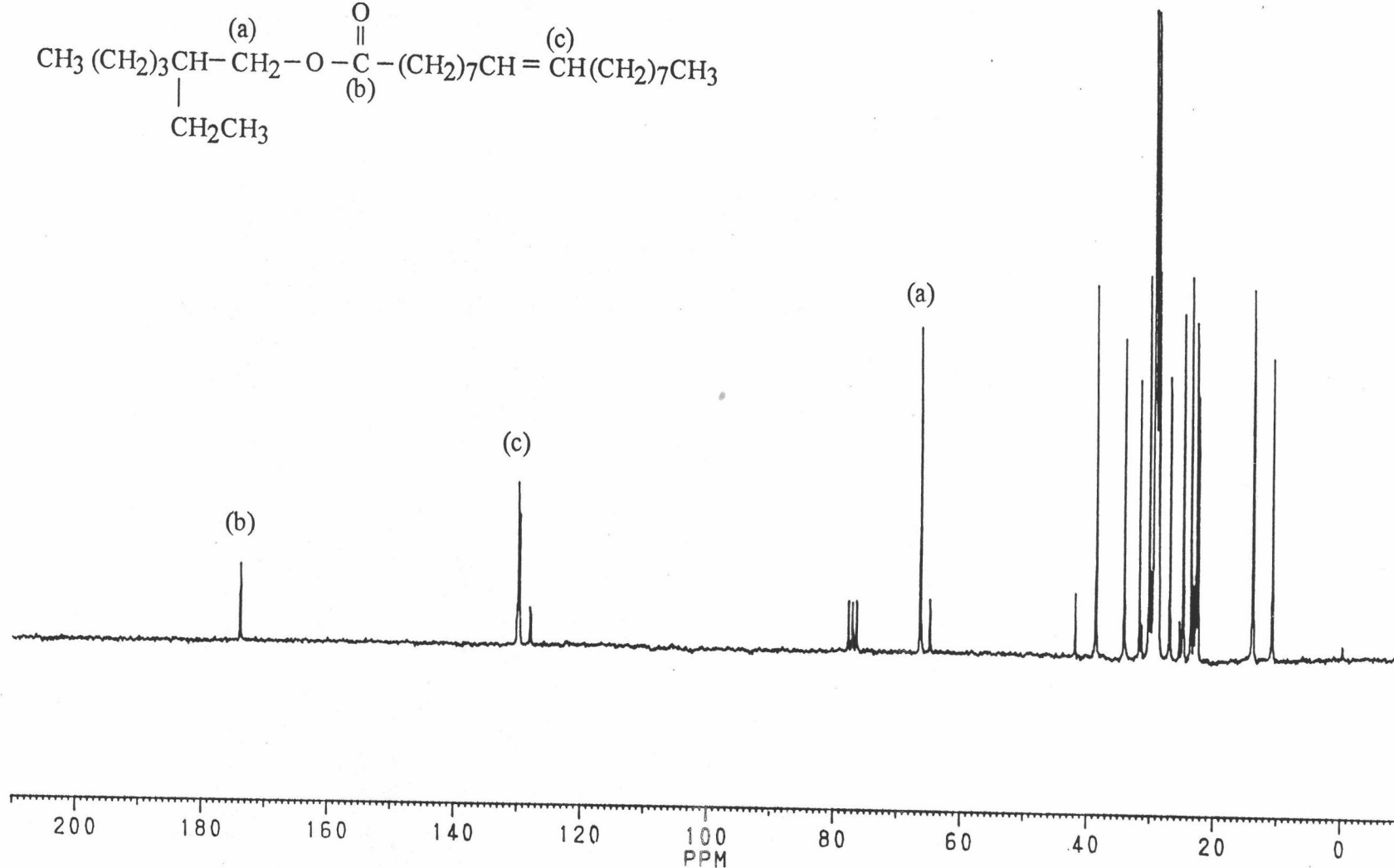
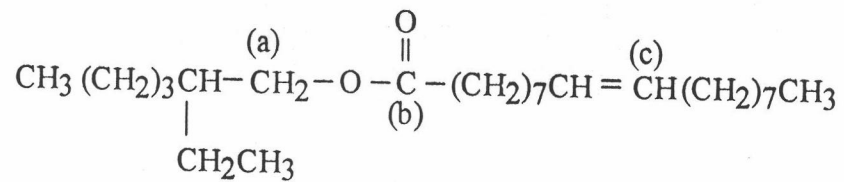


Figure A12 : A12 ^{13}C NMR (CDCl_3) spectrum of monoester obtained from transesterification between palm oil and 2-ethyl-1-hexanol

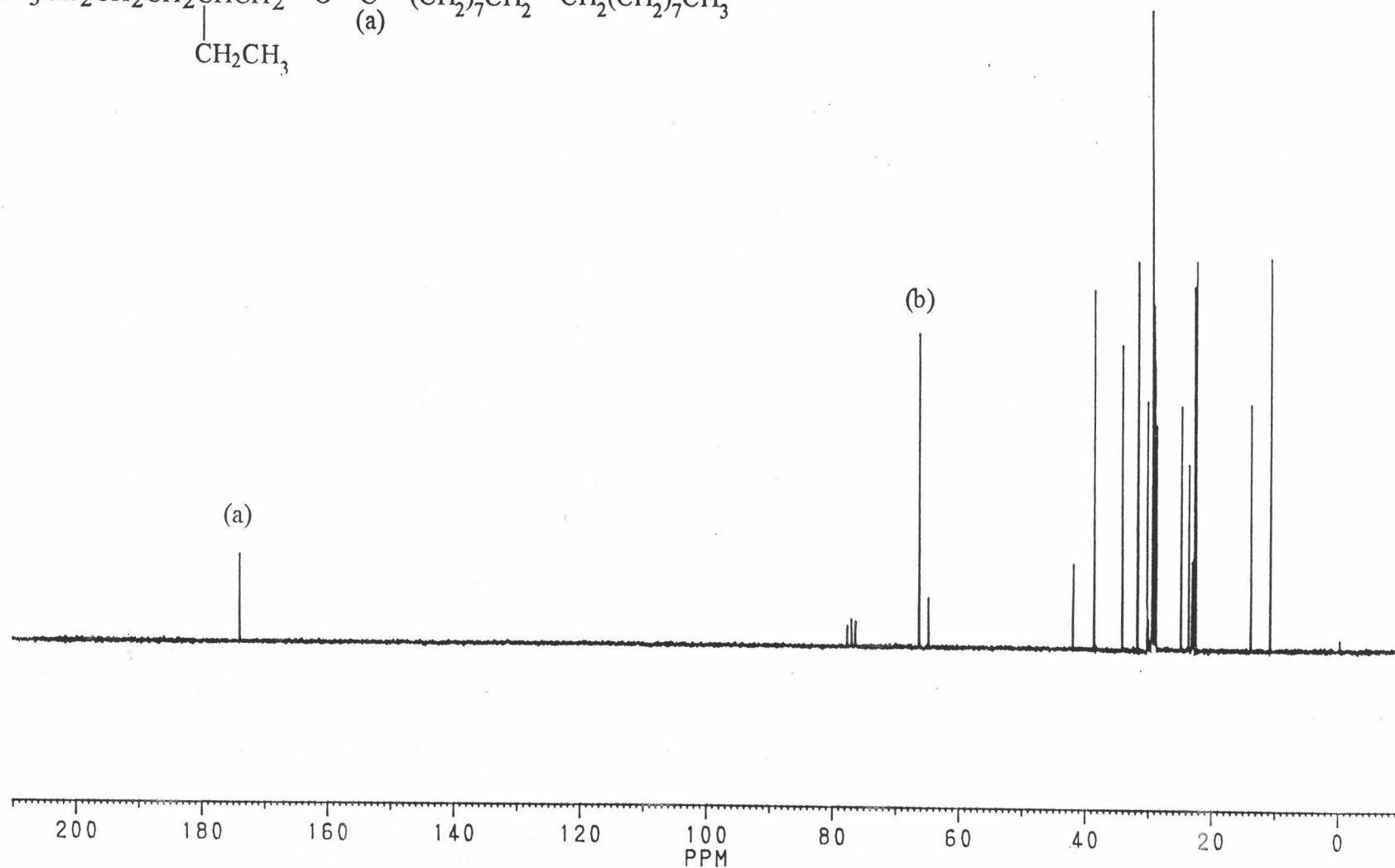
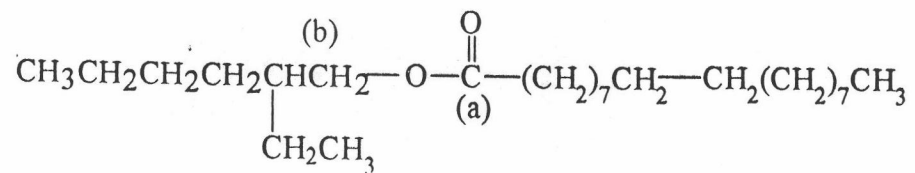


Figure A13 : ^{13}C NMR (CDCl_3) spectrum of monoester obtained from transesterification between palm oil and 2-ethyl-1-hexanol (after hydrogenate)

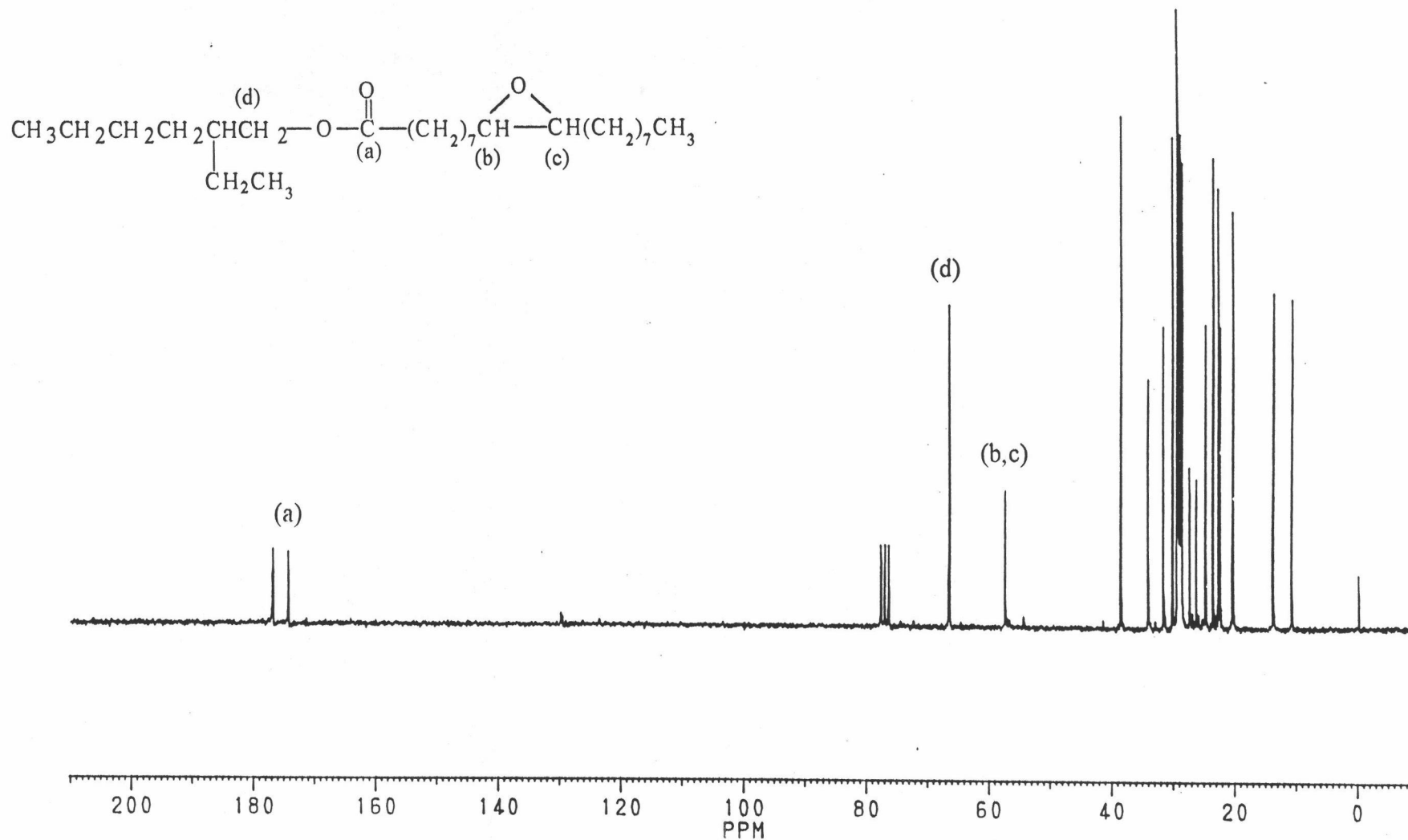


Figure A14 : ^{13}C NMR (CDCl_3) spectrum of monoester obtained from transesterification between palm oil and 2-ethyl-1-hexanol (after peroxydation)

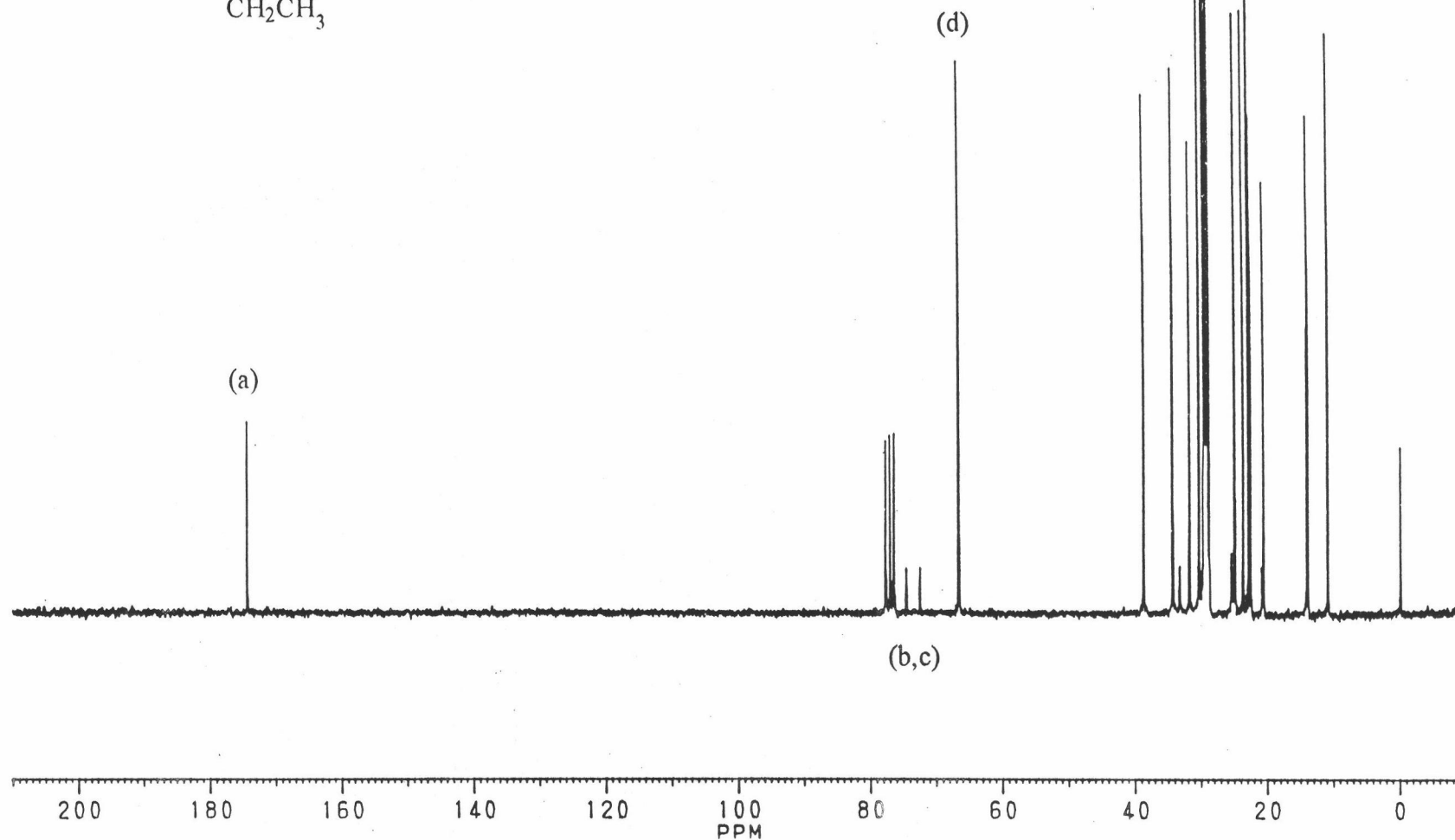
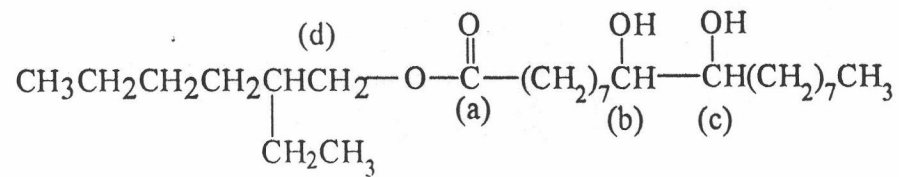


Figure A15 : ¹³C NMR (CDCl₃) spectrum of monoester obtained from transesterification between palm oil and 2-ethyl-1-hexanol (after ring opening)

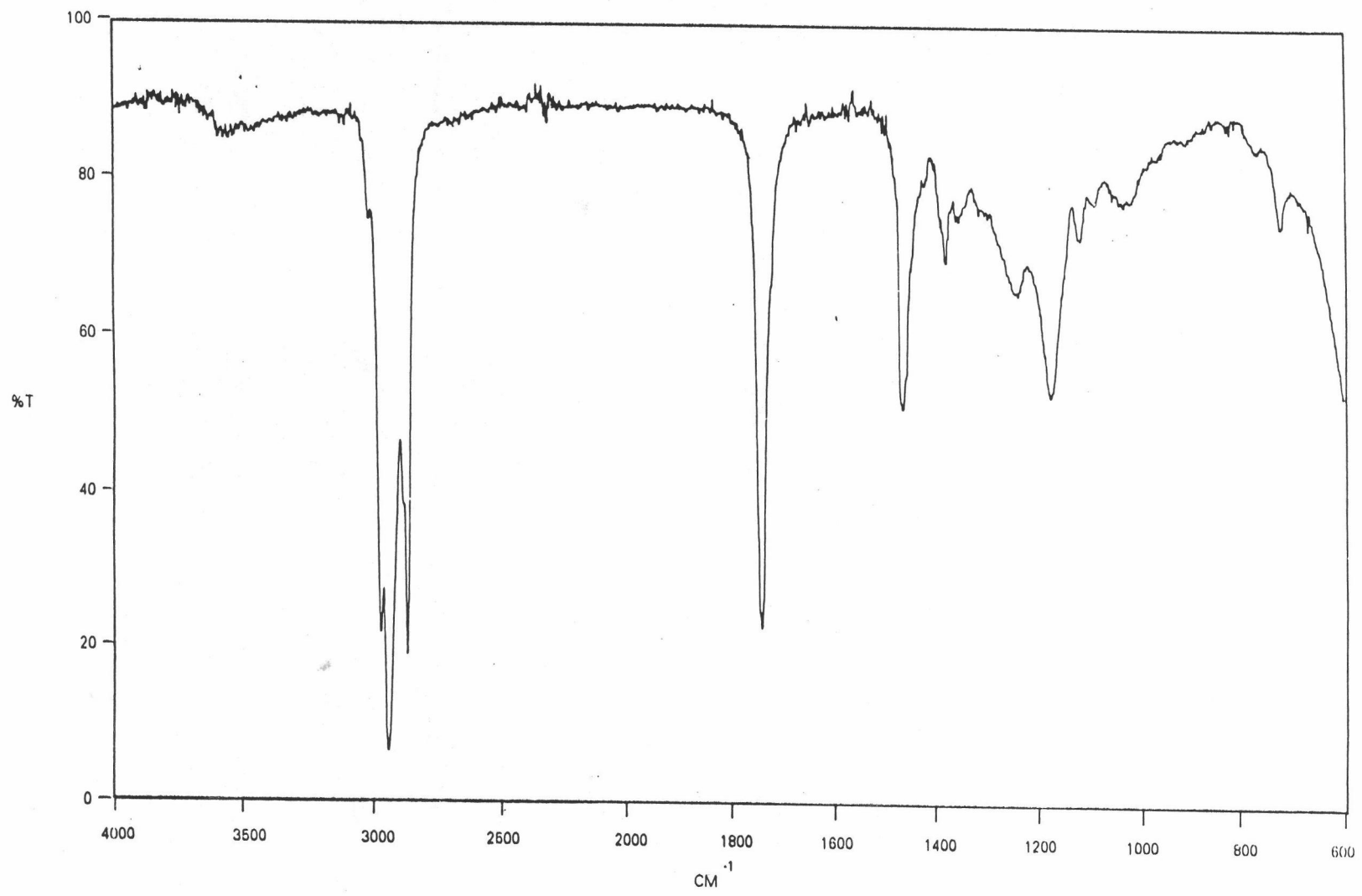


Figure A16 : IR spectrum of 2-ethyl-1-hexyl ester

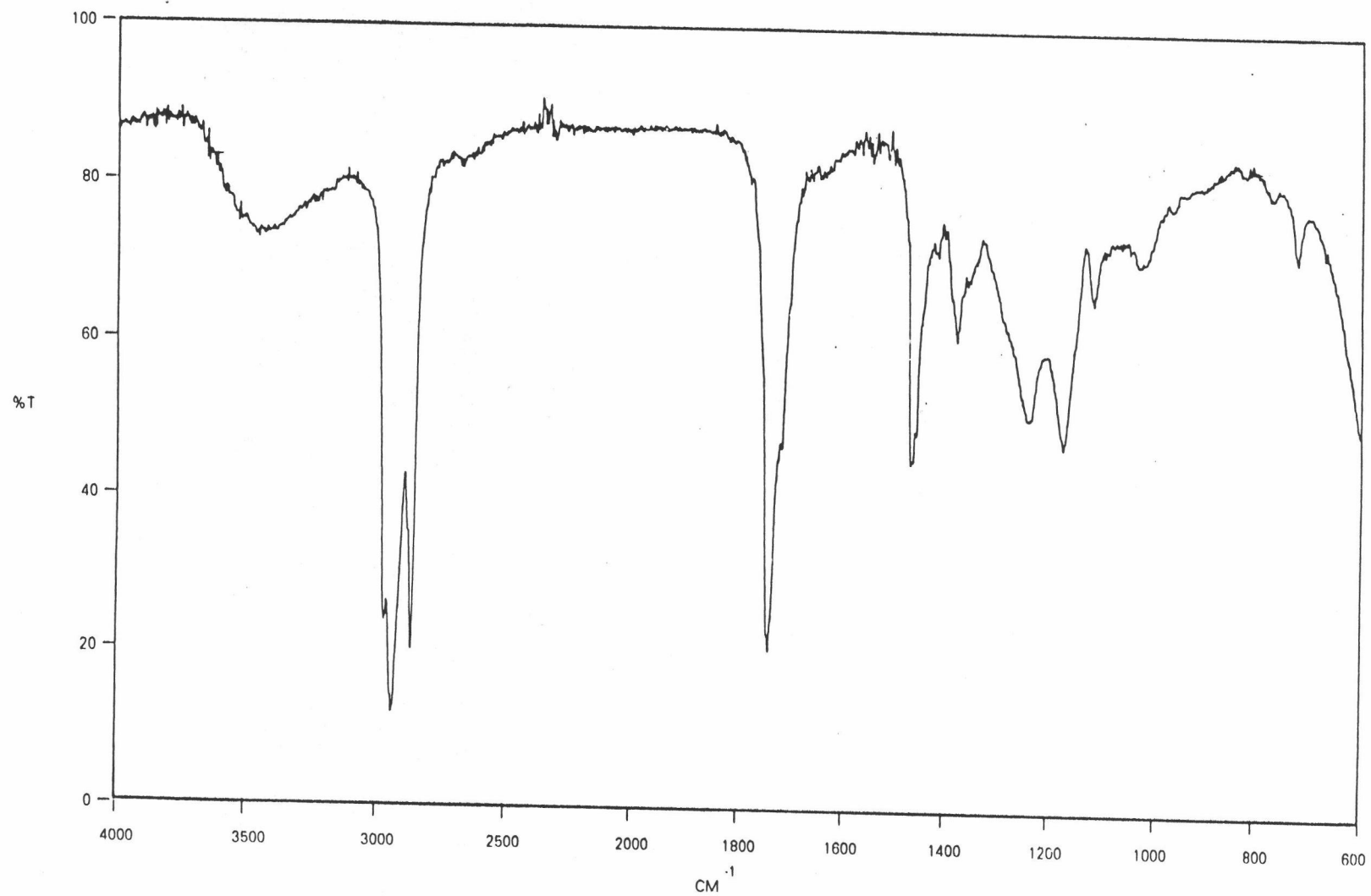


Figure A17 : IR spectrum of 2-ethyl-1-hexyl ester (after hydroxylation)

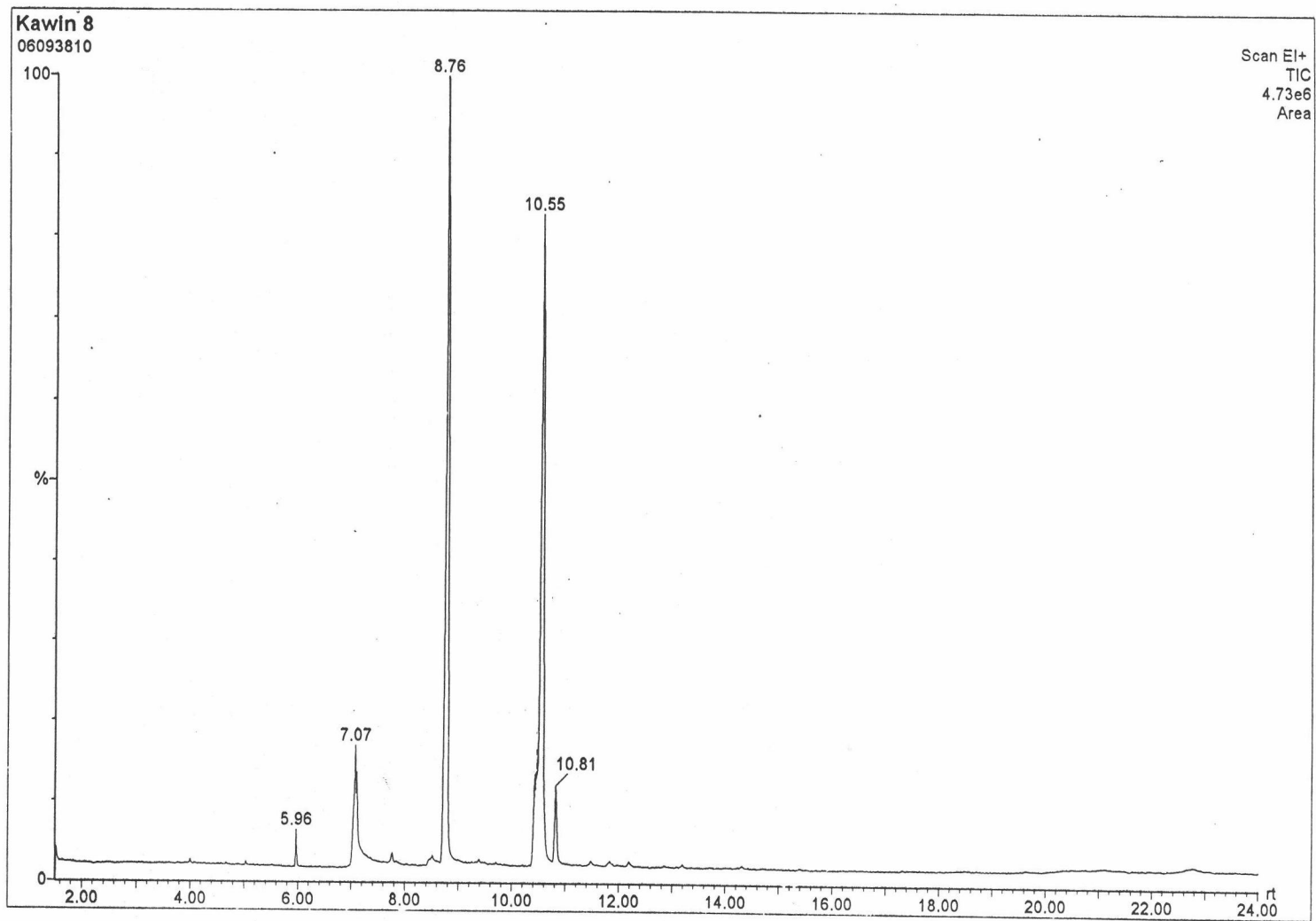


Figure A18 : GC-chromatogram of butyl ester

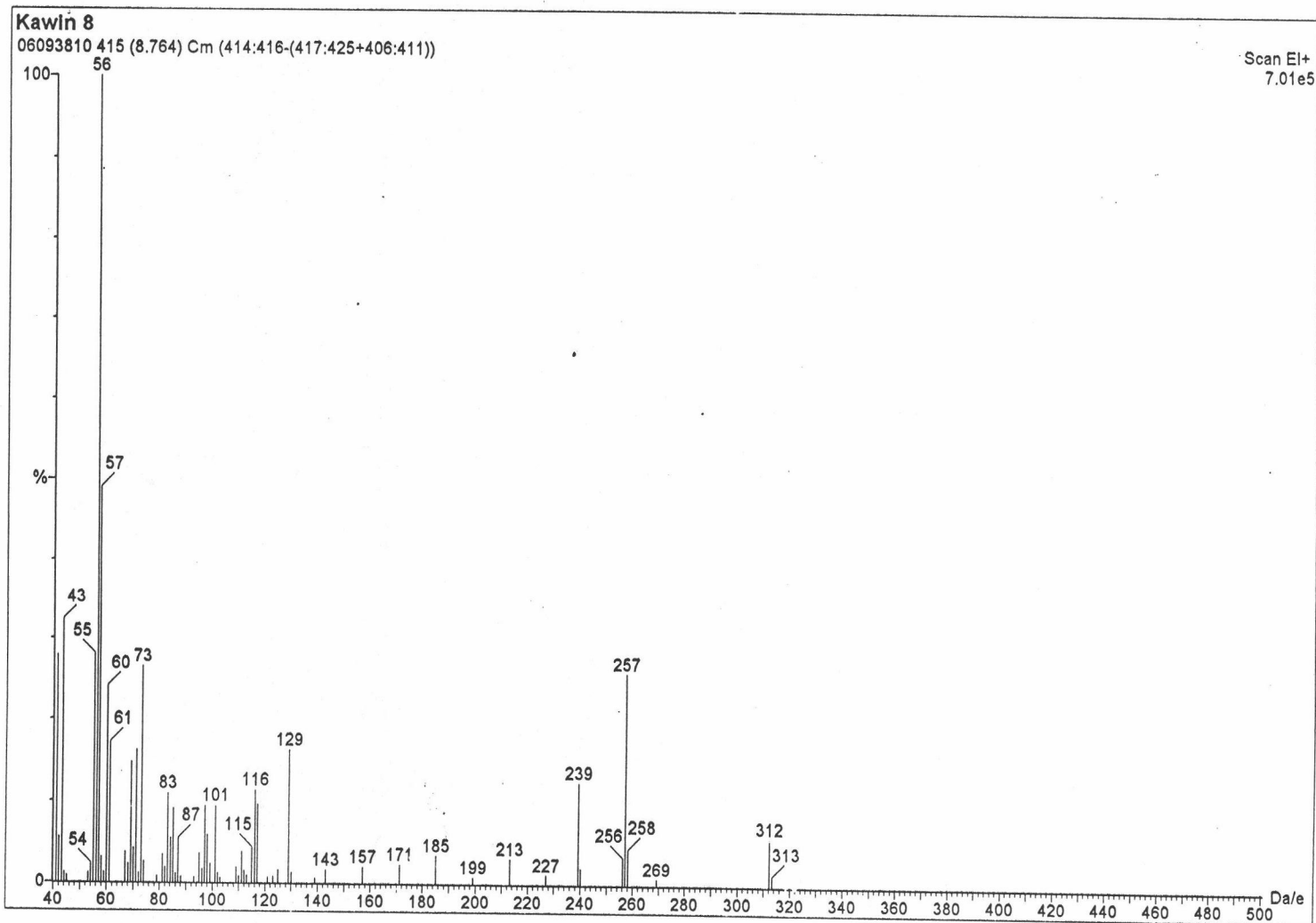


Figure A19 : Mass spectrum of butyl palmitate at retention time 8.76 in Figure A18

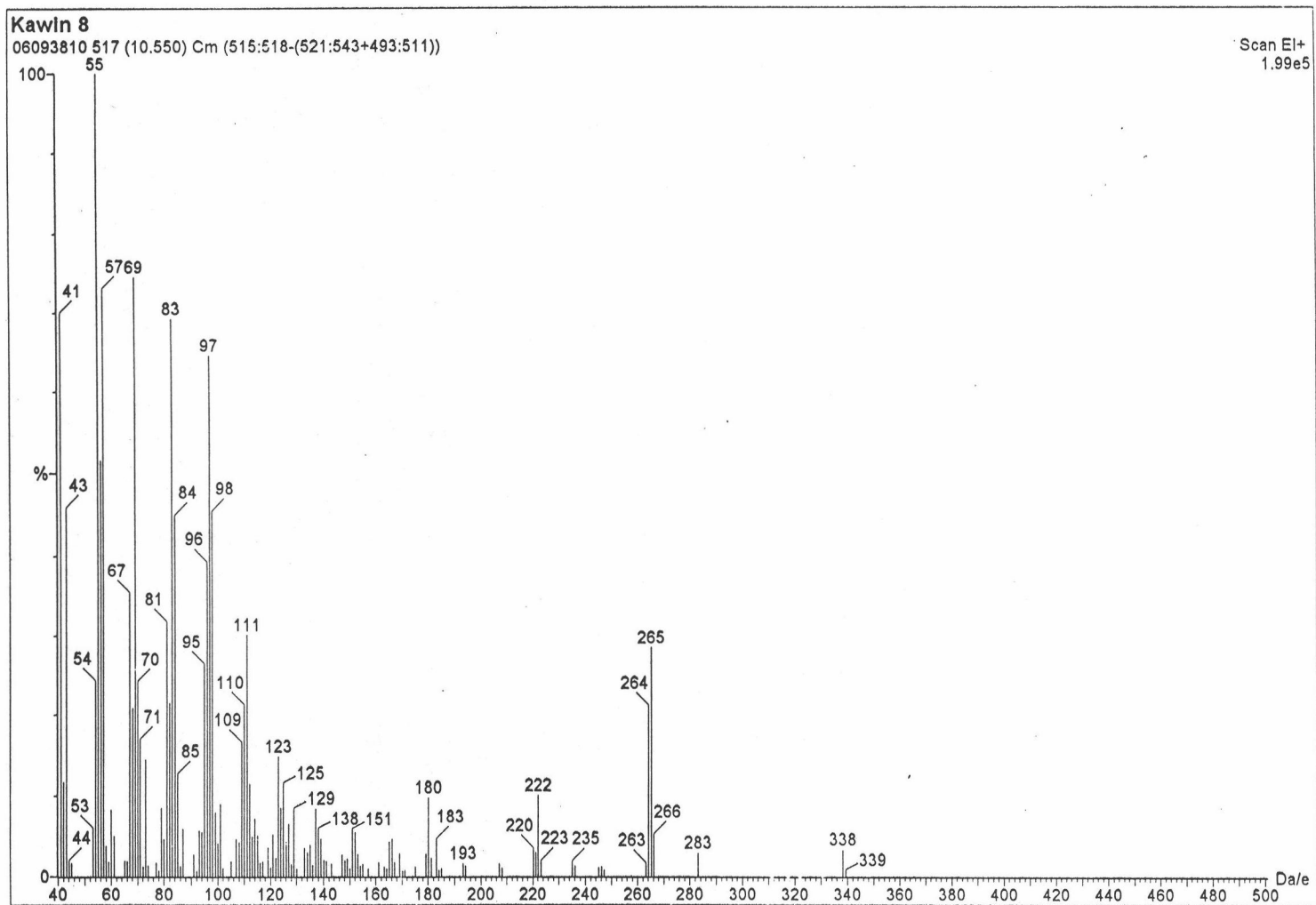


Figure A20 : Mass spectrum of butyl oleate at retention time 10.55 in Figure A18

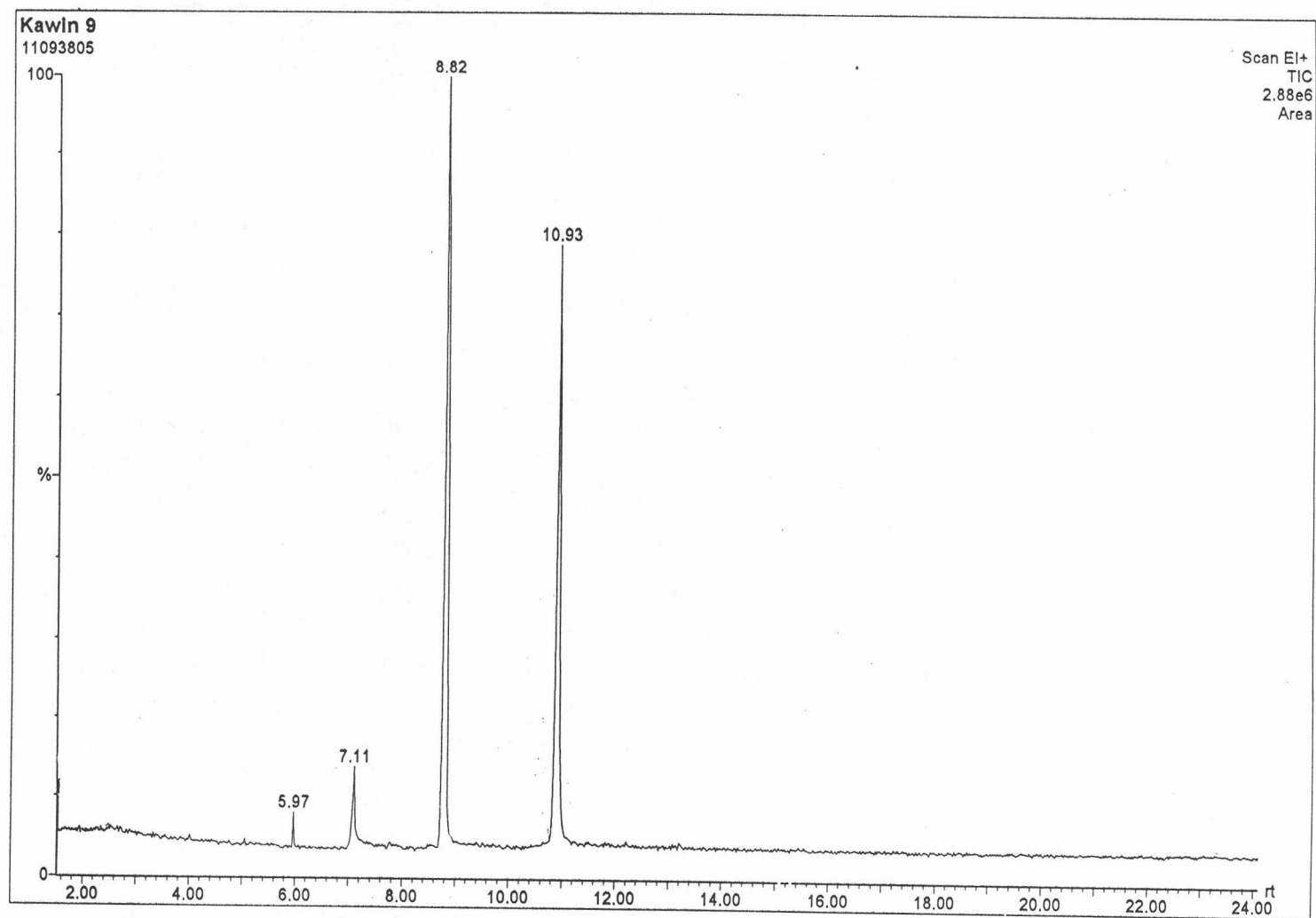


Figure A21 : GC-chromatogram of hydrogenated butyl ester

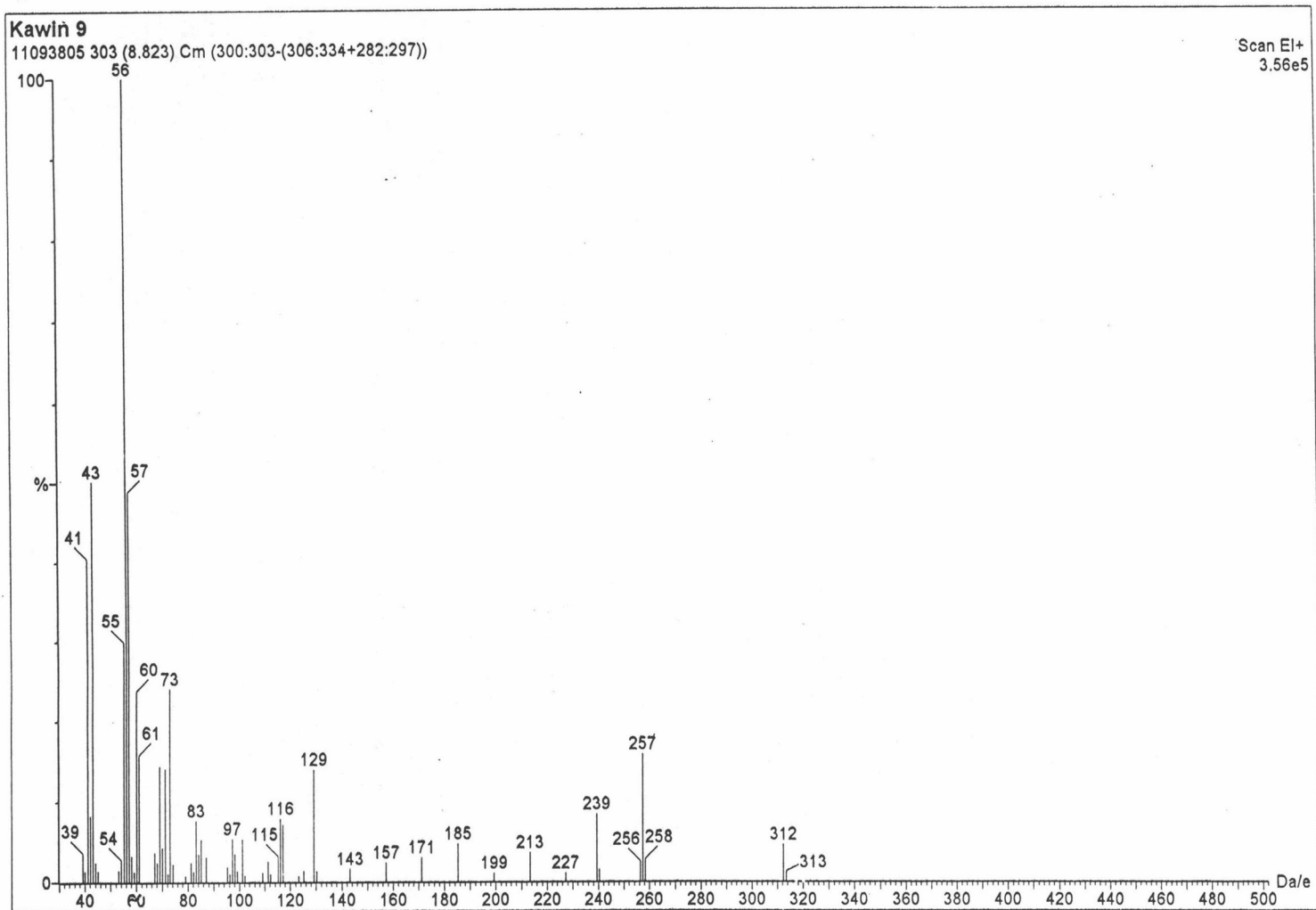


Figure A22 : Mass spectrum of butyl palmitate at retention time 8.82 in Figure A21

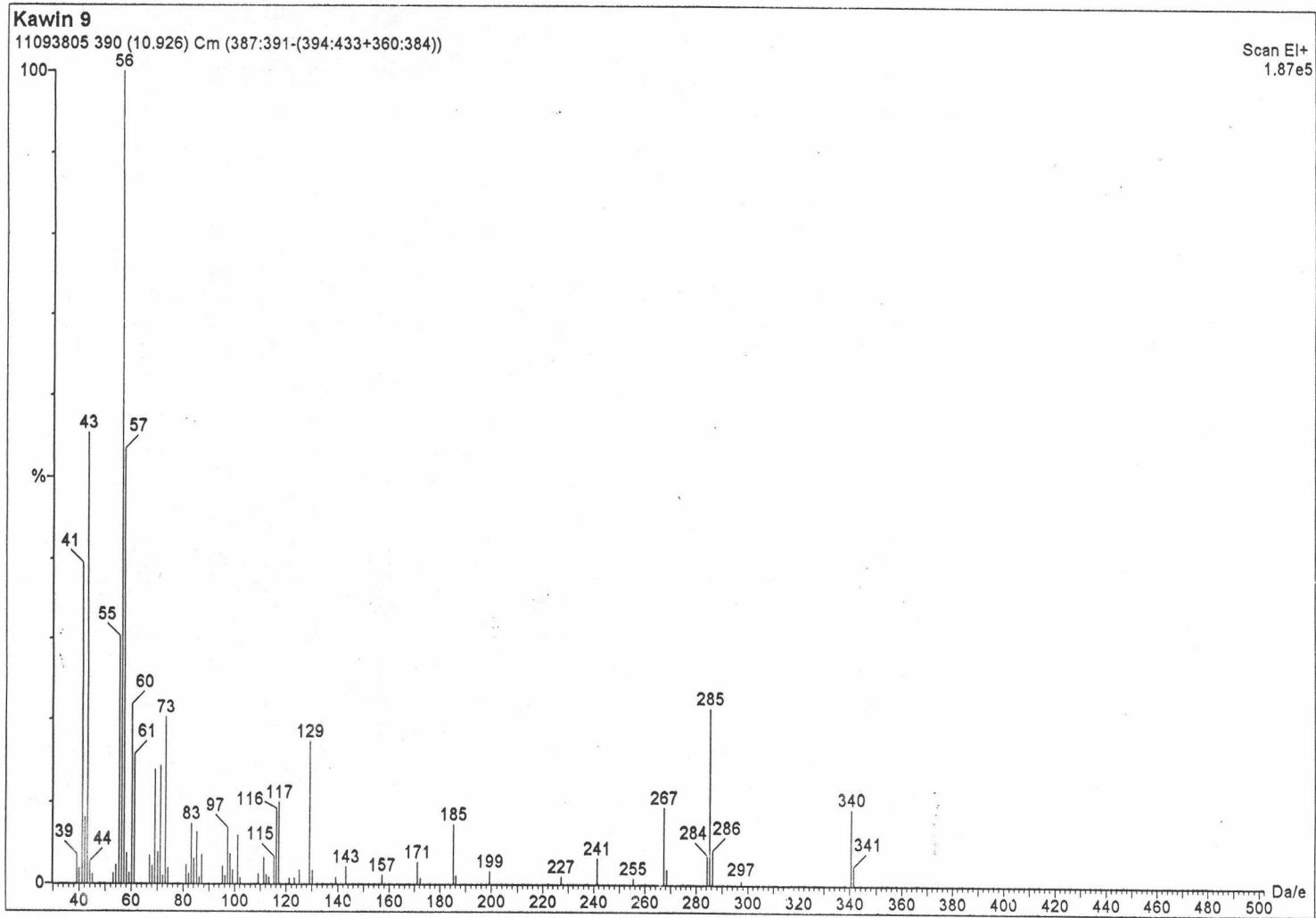


Figure A23 : Mass spectrum of butyl stearate at retention time 10.93 in Figure A21

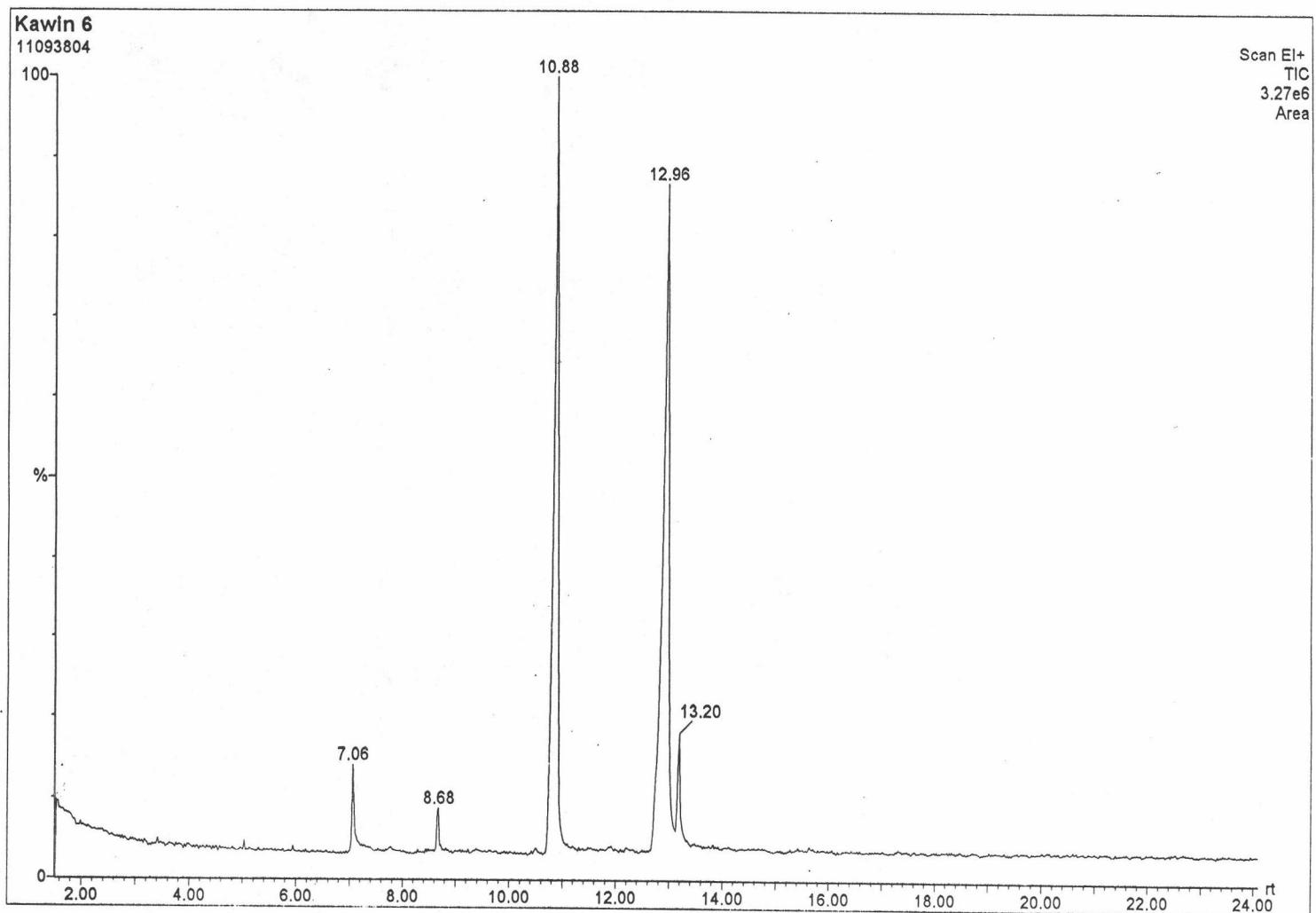


Figure A24 : GC-chromatogram of hexyl ester

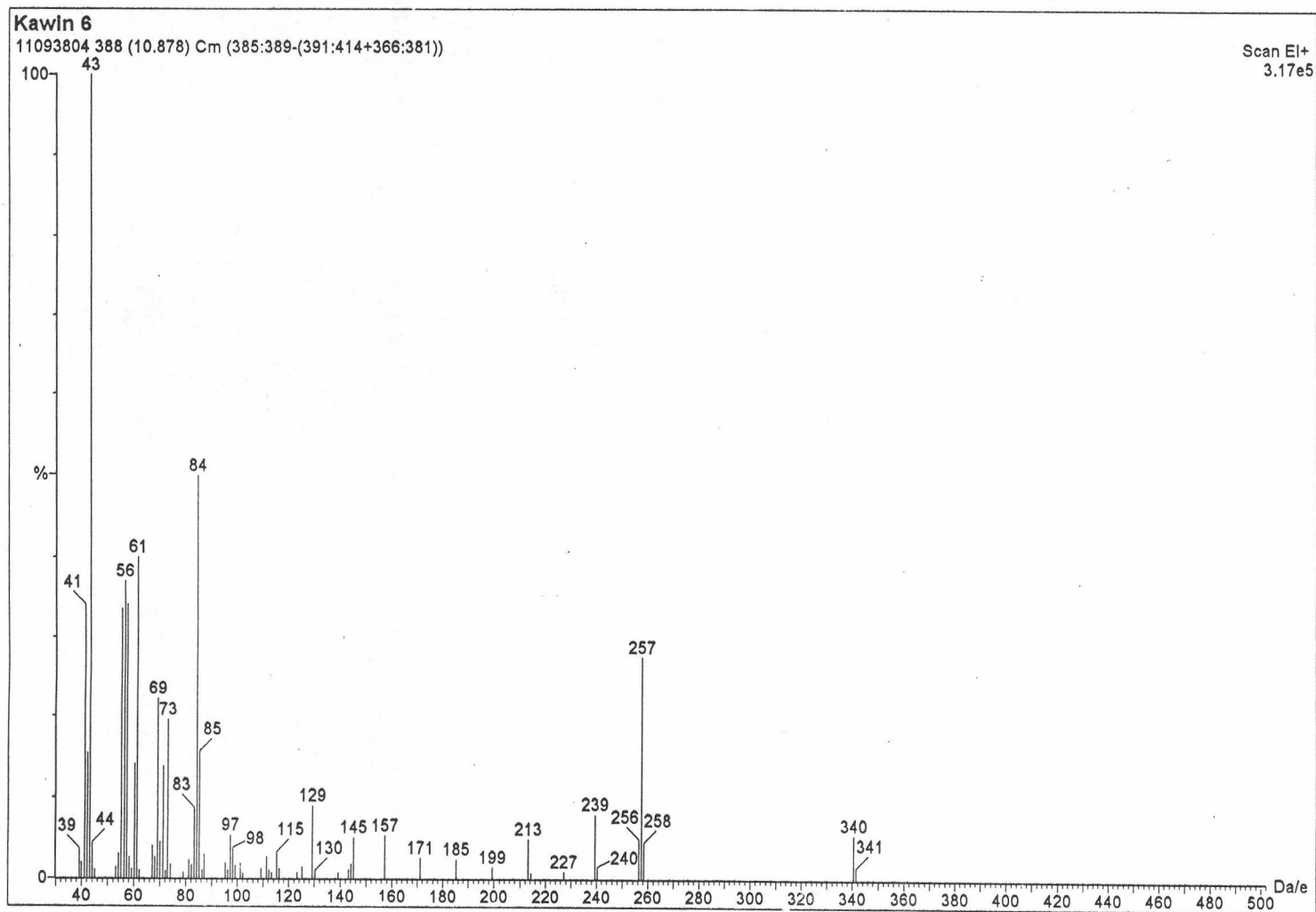


Figure A25 : Mass spectrum of hexyl palmitate at retention time 10.88 in Figure A24

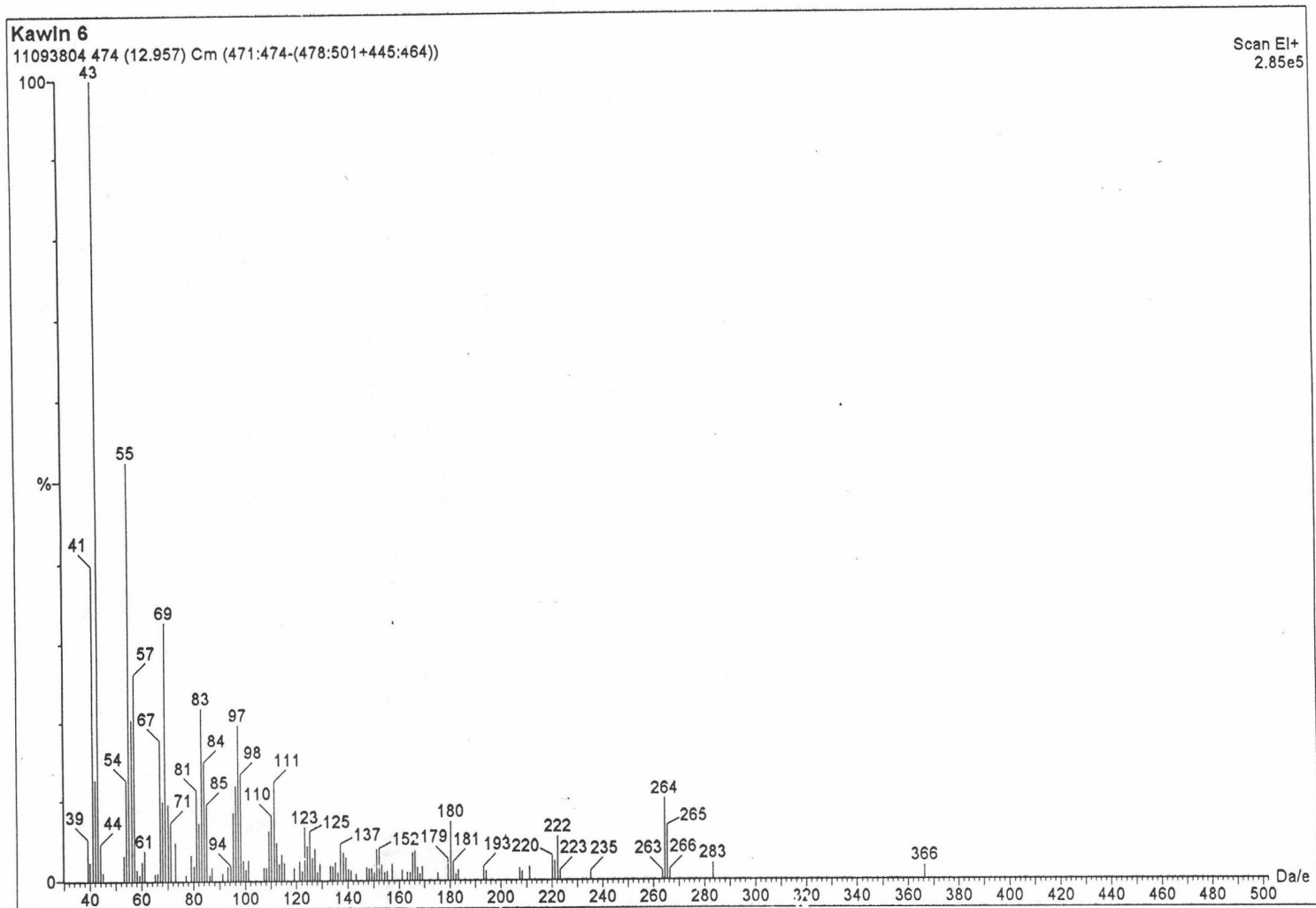


Figure A26 : Mass spectrum of hexyl oleate at retention time 12.96 in Figure A24

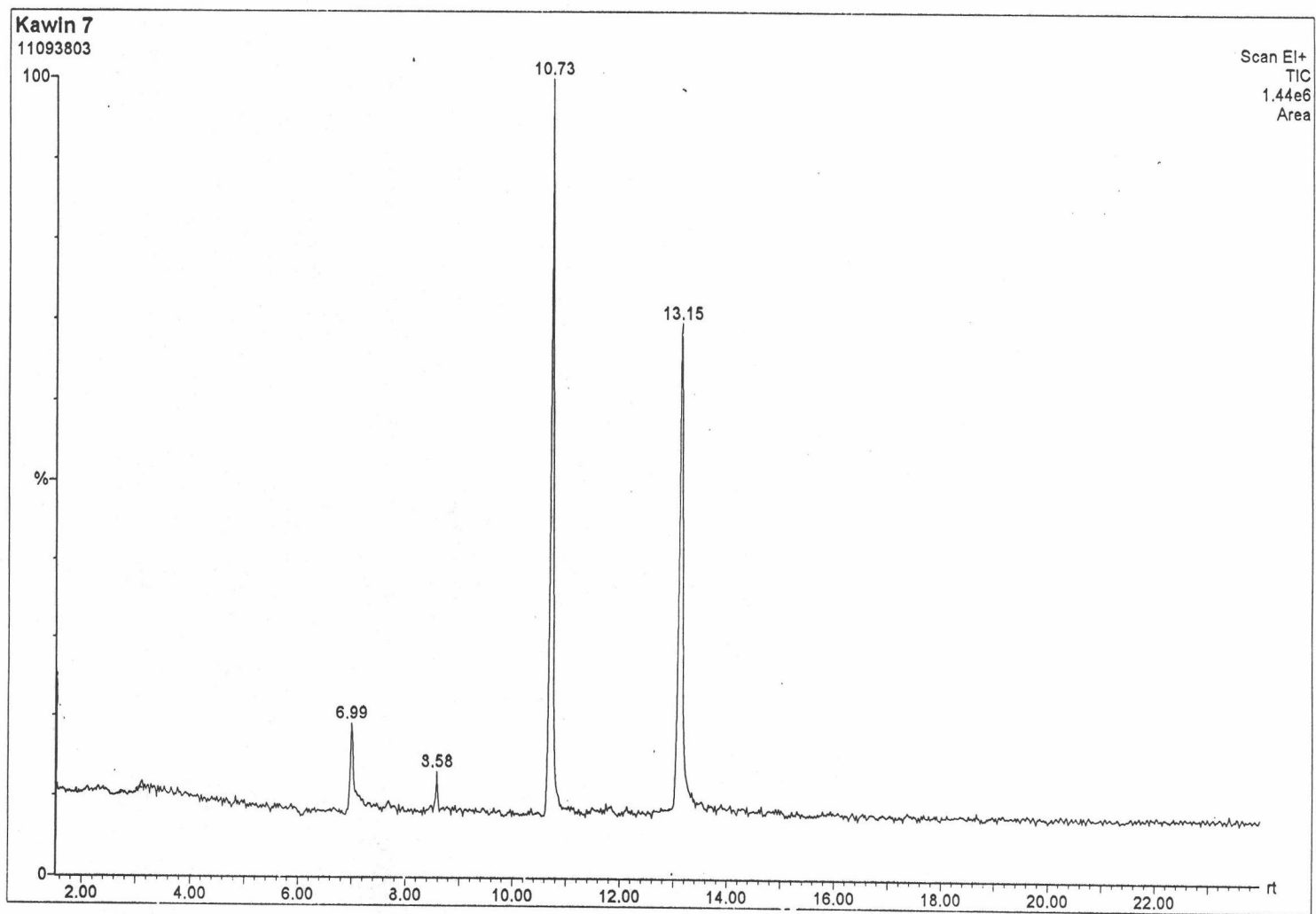


Figure A27 : GC-chromatogram of hydrogenated hexyl ester

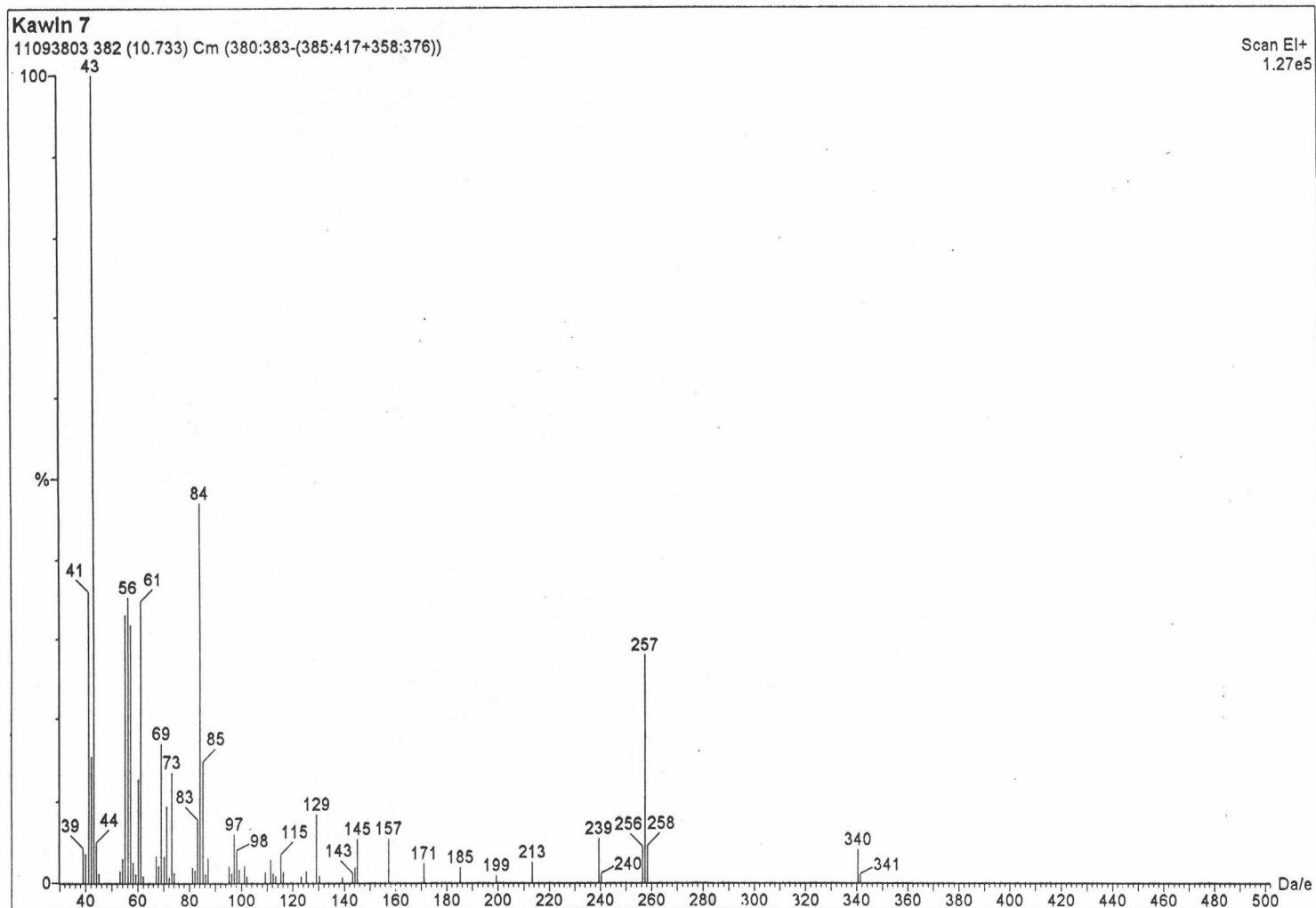


Figure A28 : Mass spectrum of hexyl palmitate at retention time 10.73 in Figure A27

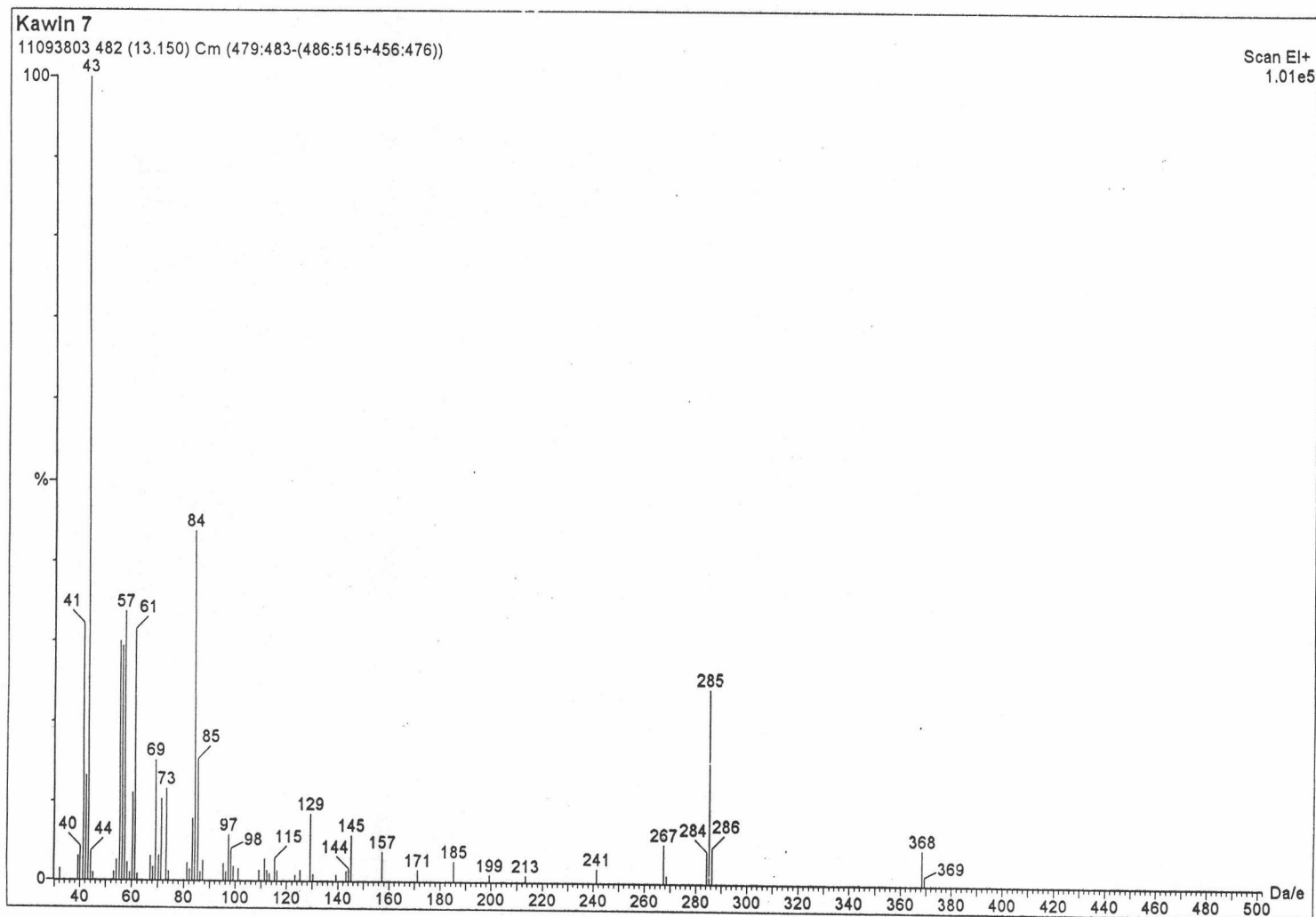


Figure A29 : Mass spectrum of hexyl stearate at retention time 13.15 in Figure A27

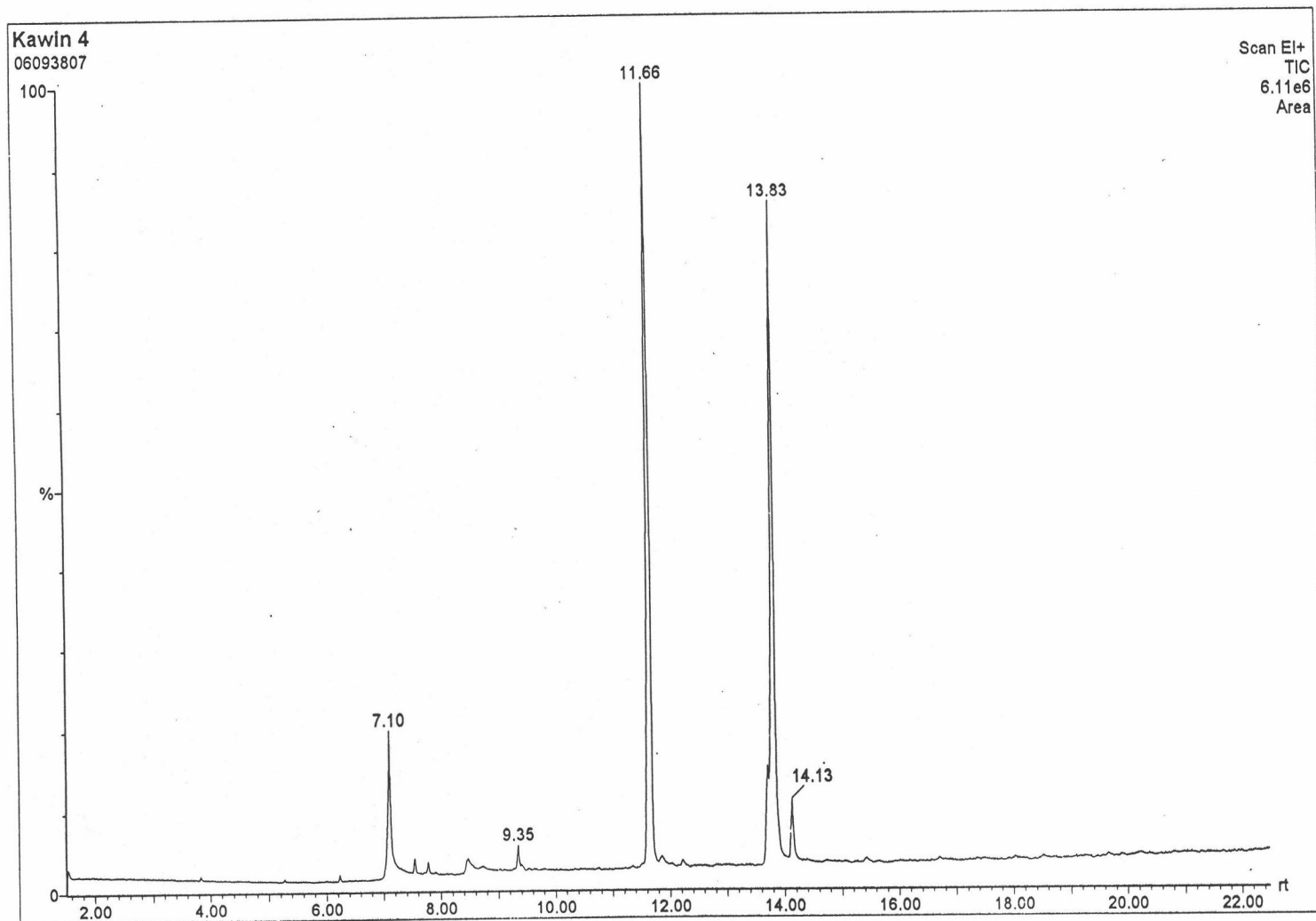


Figure A30 : GC-chromatogram of cyclohexyl ester

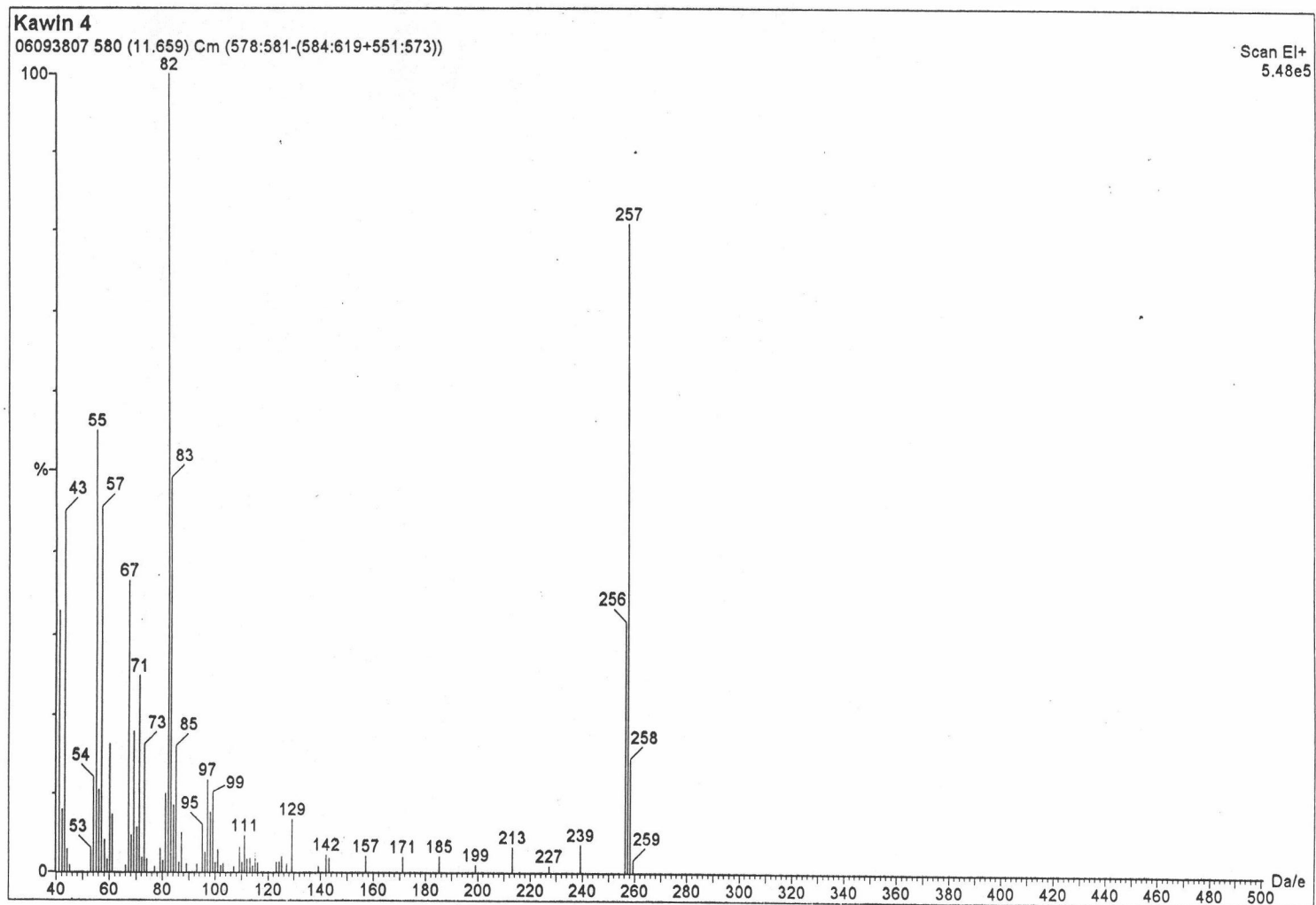


Figure A31 : Mass spectrum of cyclohexyl palmitate at retention time 11.66 in Figure A30

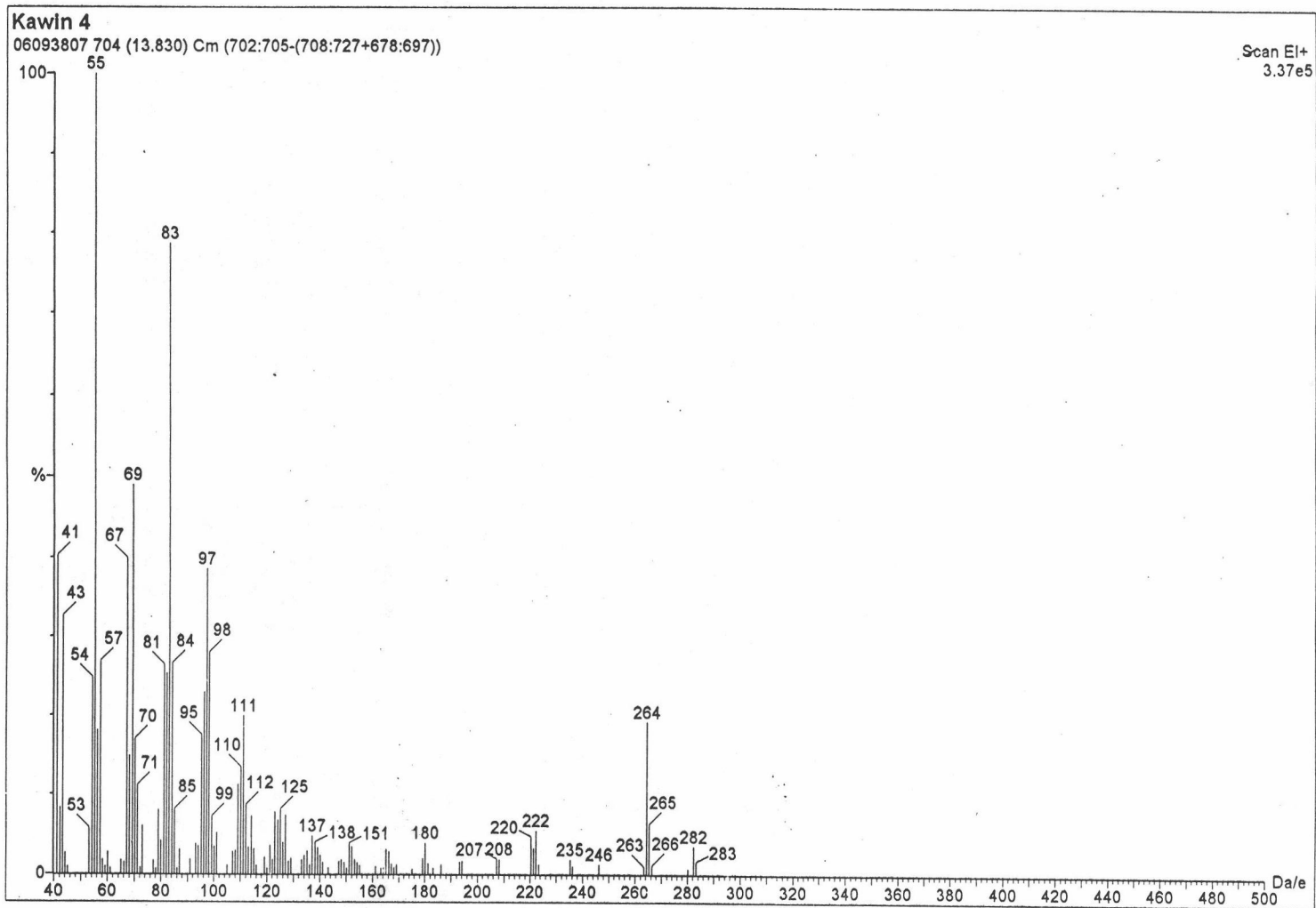


Figure A32 : Mass spectrum of cyclohexyl oleate at retention time 13.83 in Figure A30

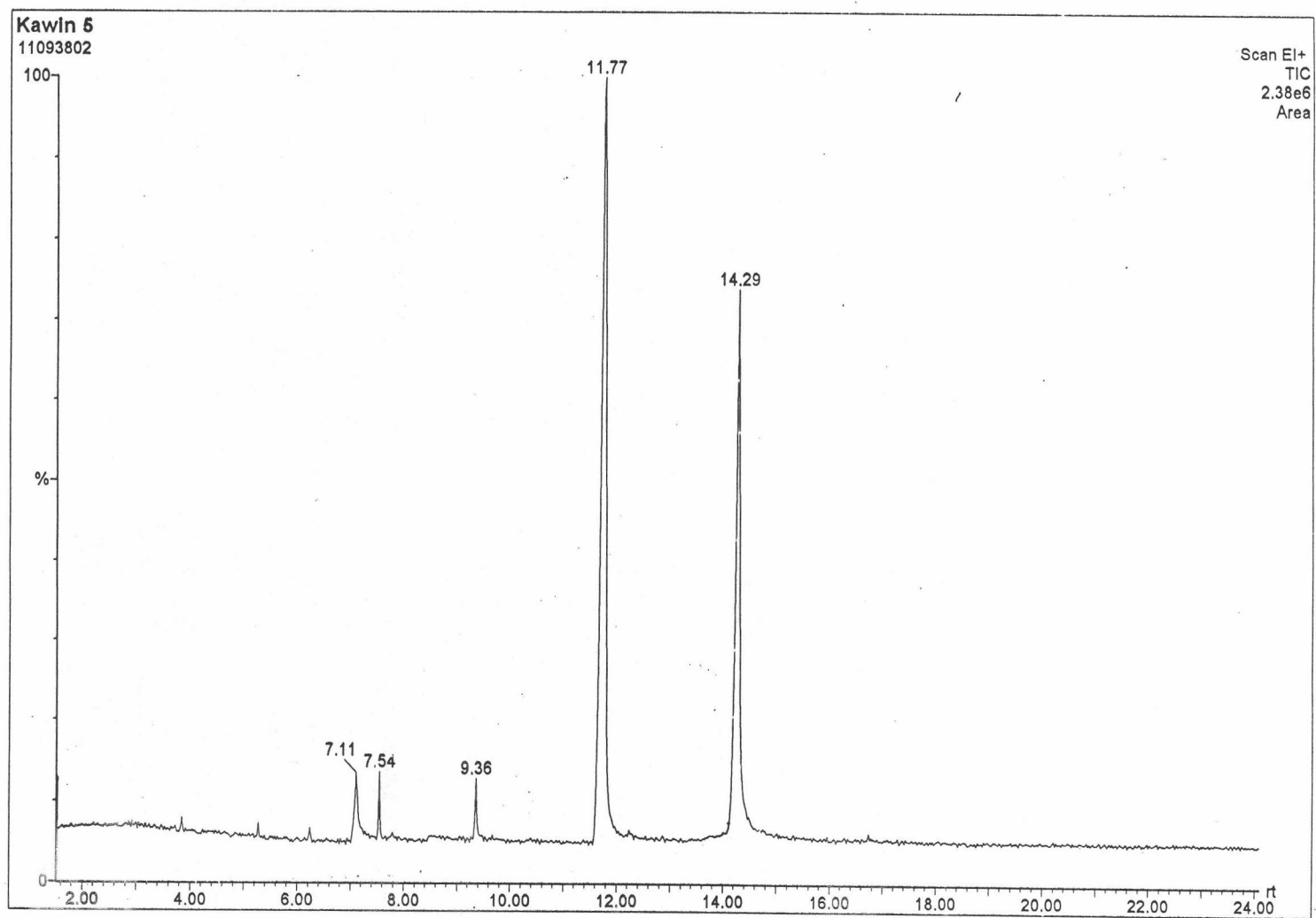


Figure A33 : GC-chromatogram of hydrogenated cyclohexyl ester

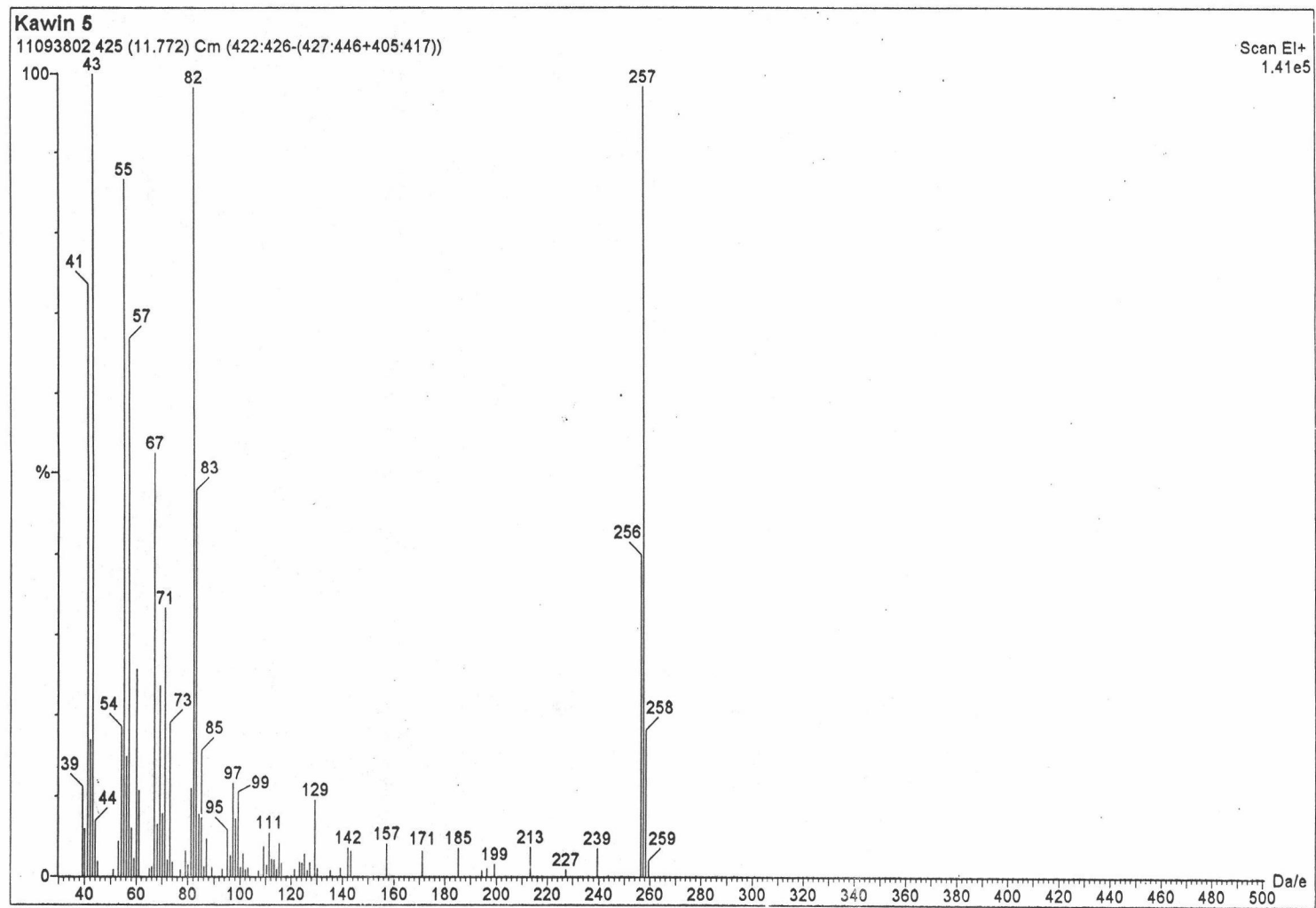


Figure A34 : Mass spectrum of cyclohexyl palmitate at retention time 11.77 in Figure A33

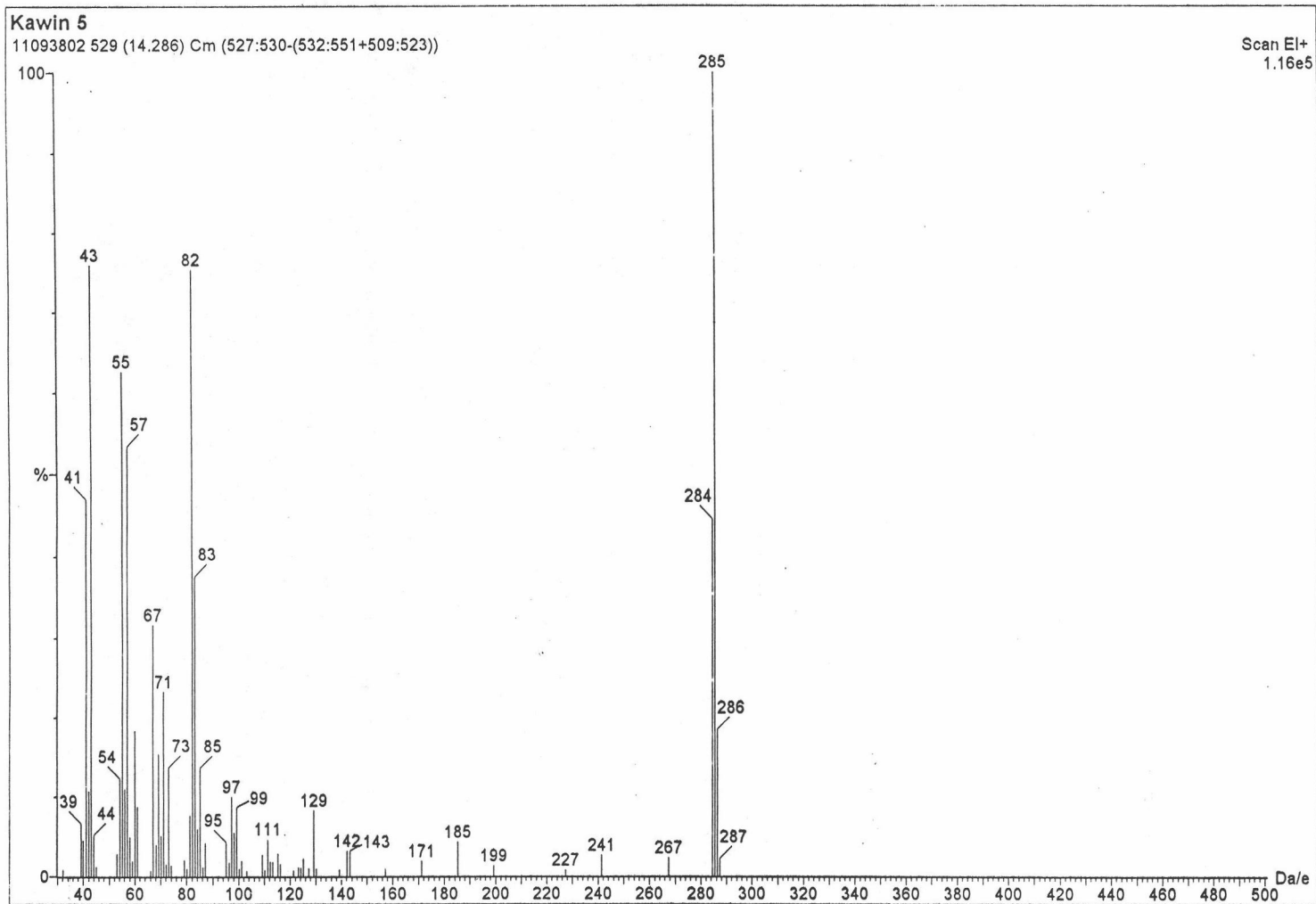


Figure A35 : Mass spectrum of cyclohexyl stearate at retention time 14.29 in Figure A33

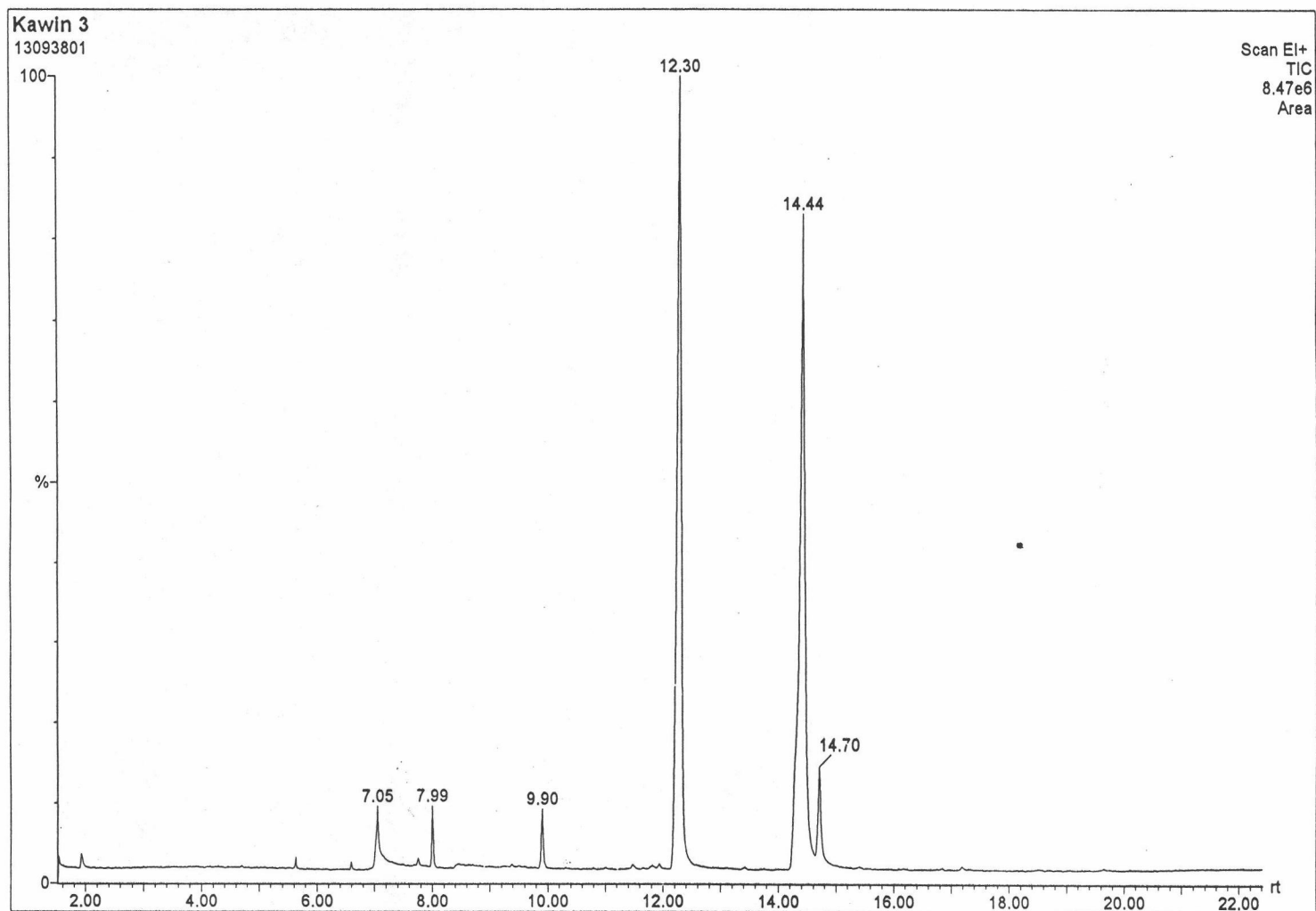


Figure A36 : GC-chromatogram of 2-ethylhexyl ester

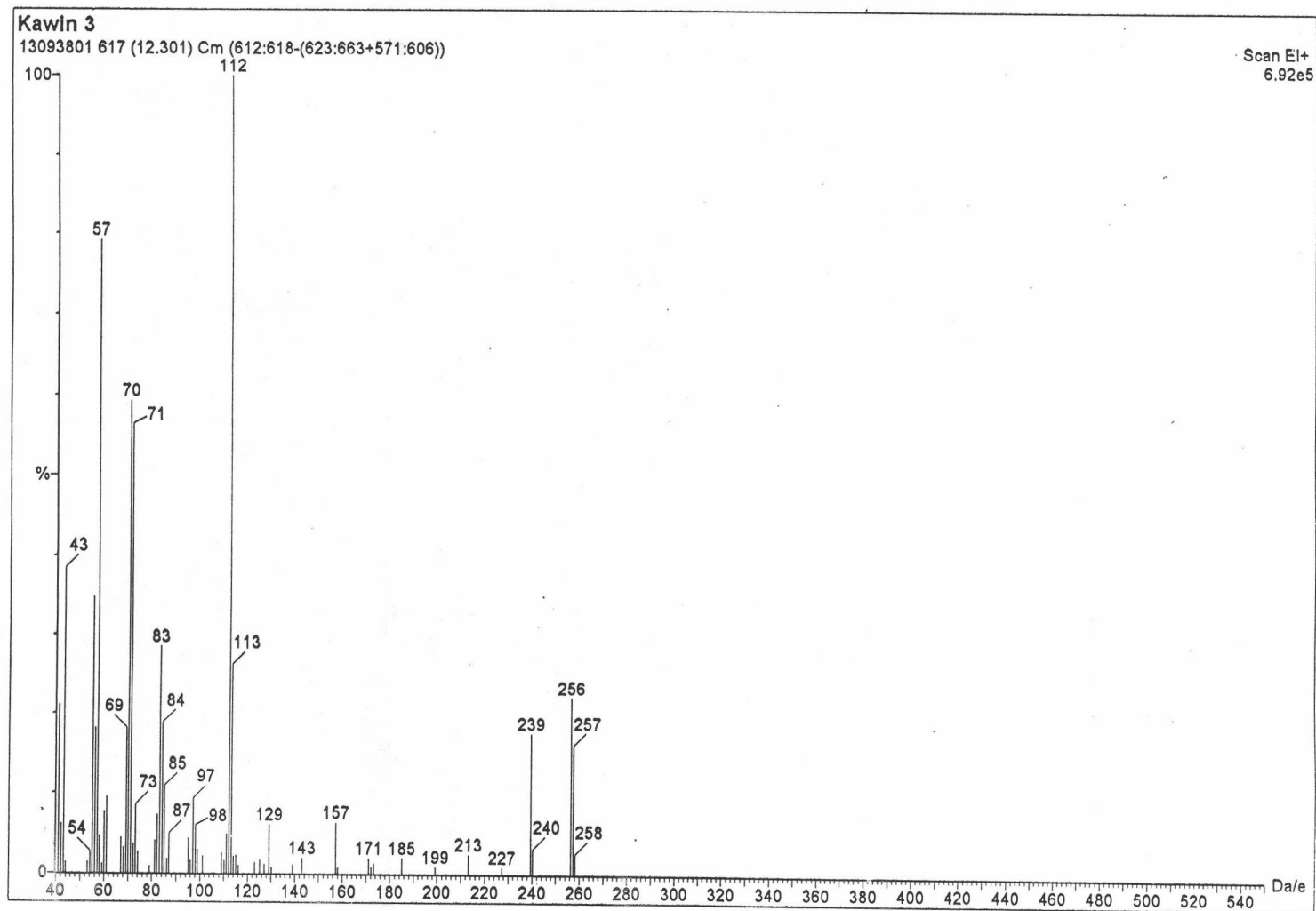


Figure A37 : Mass spectrum of 2-ethylhexyl palmitate at retention time 12.30 in Figure A36

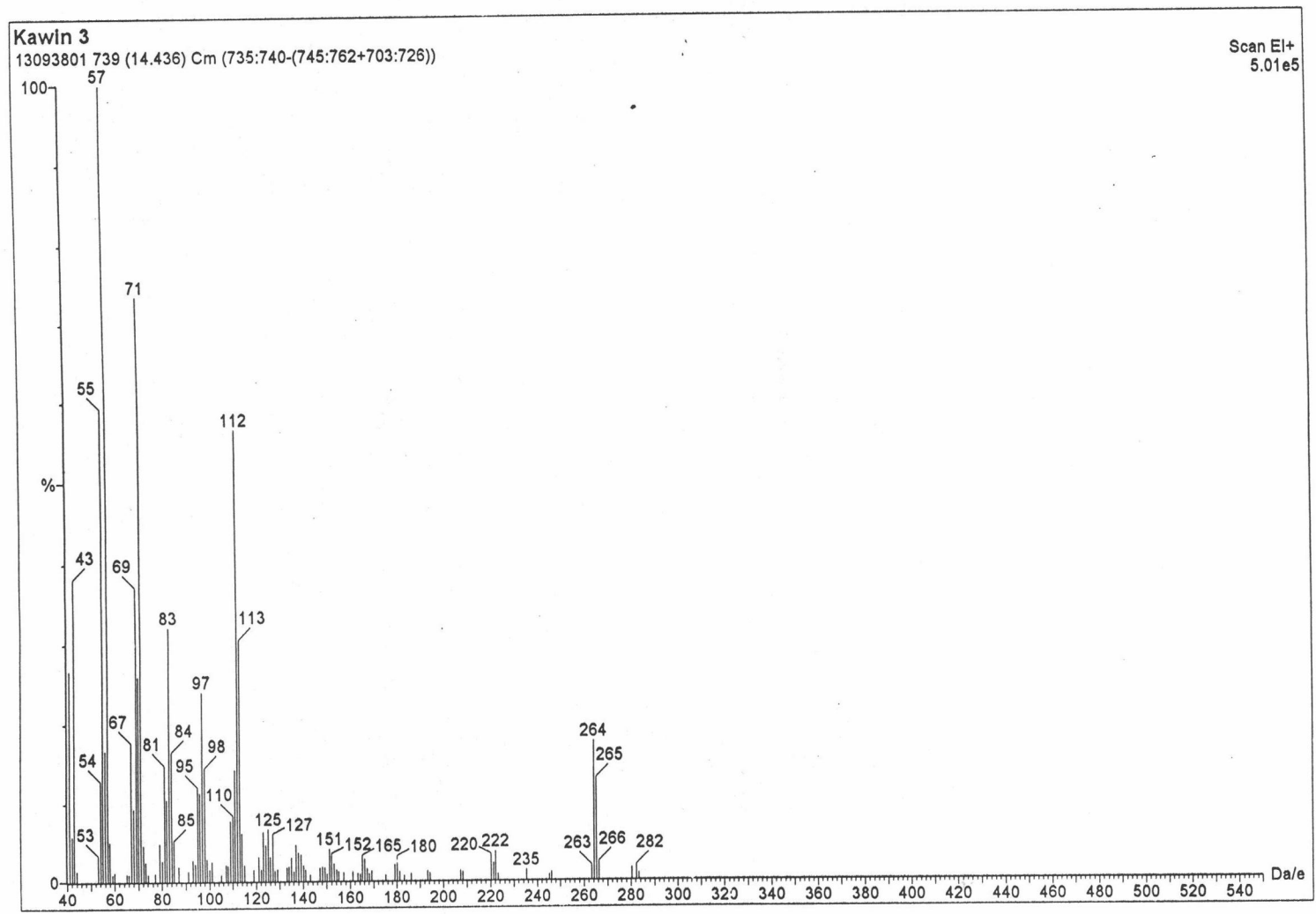


Figure A38 : Mass spectrum of 2-ethylhexyl oleate at retention time 14.44 in Figure A36

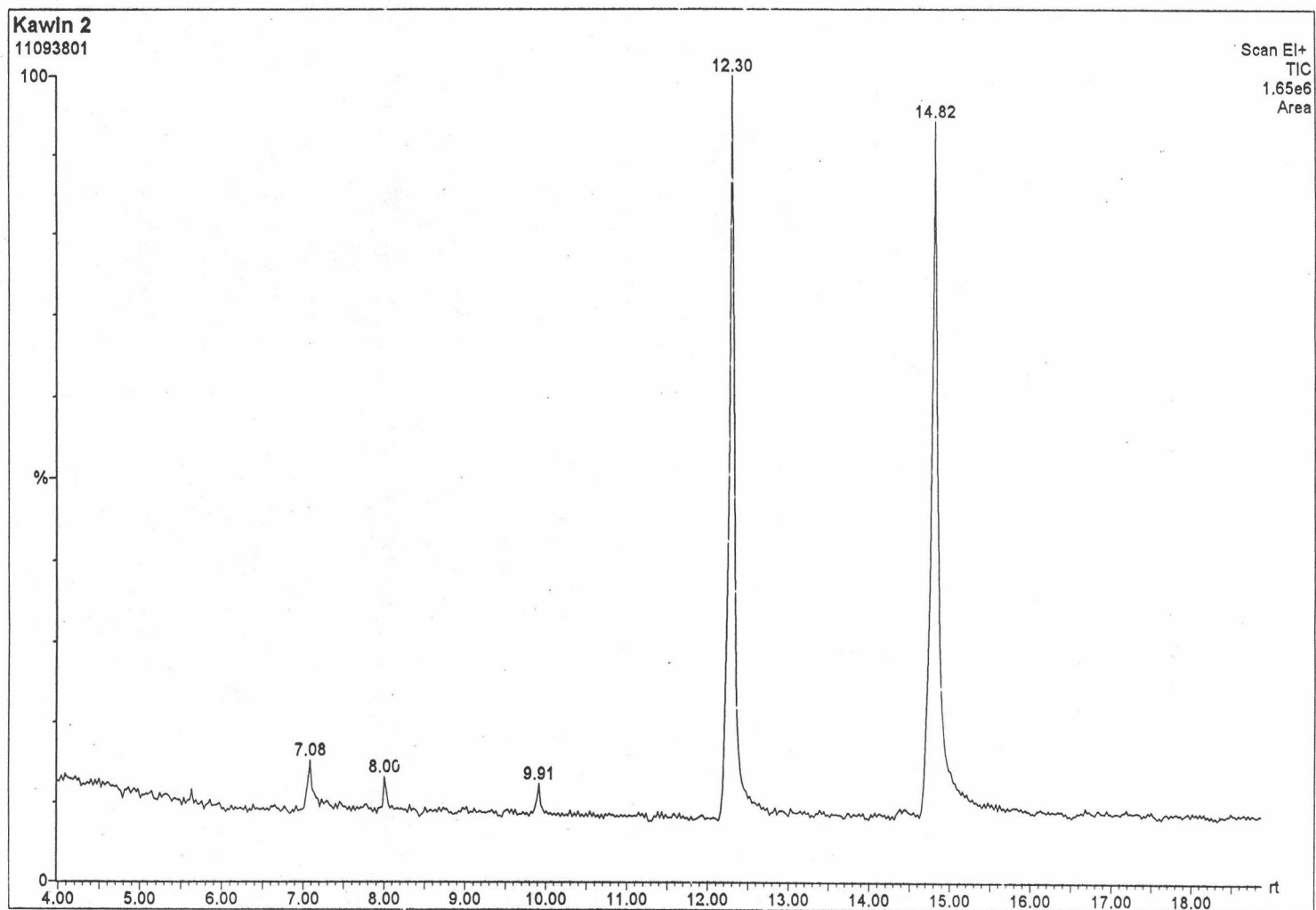


Figure A39 : GC-chromatogram of hydrogenated 2-ethylhexyl ester

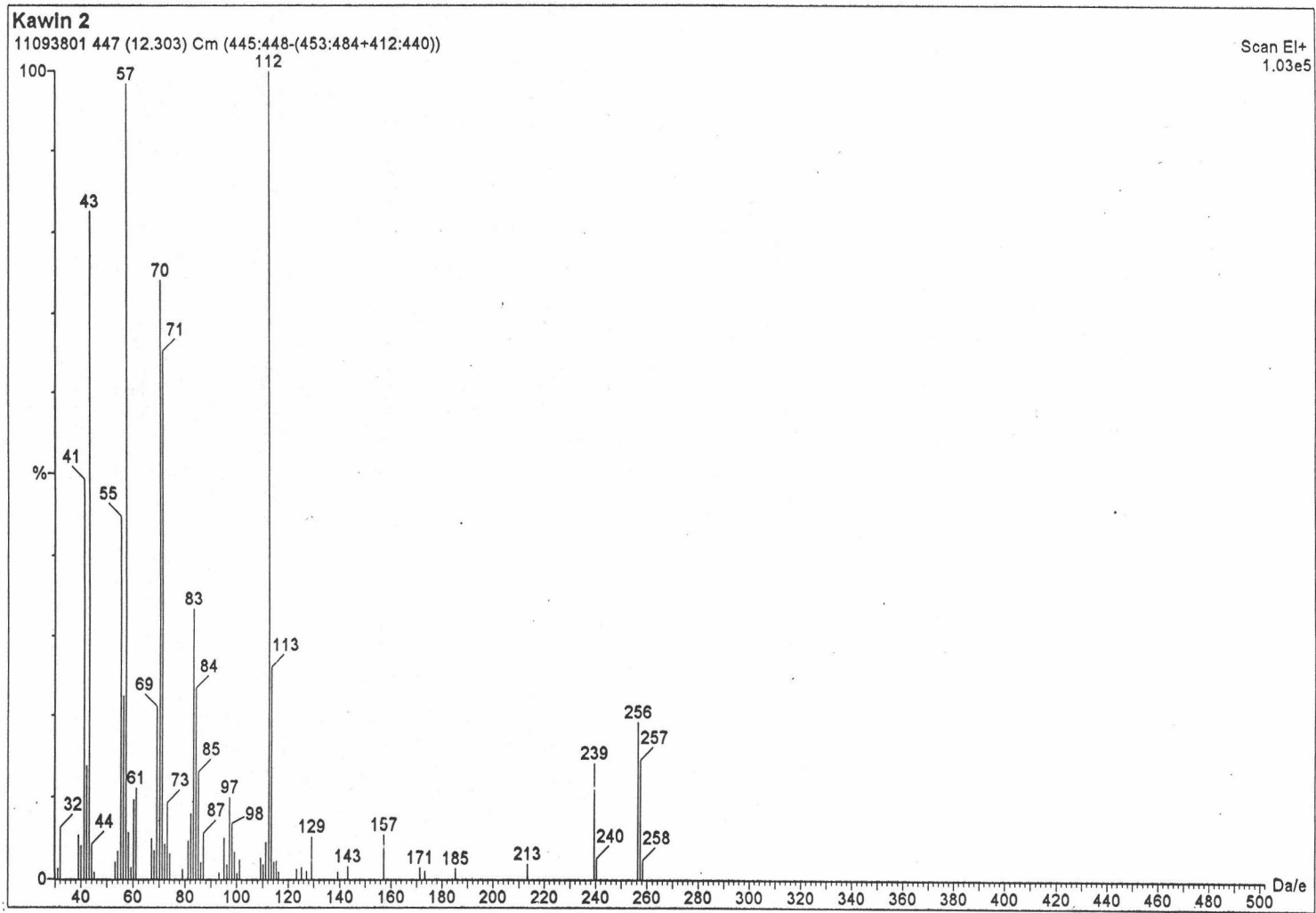


Figure A40 : Mass spectrum of 2-ethylhexyl palmitate at retention time 12.30 in Figure A39

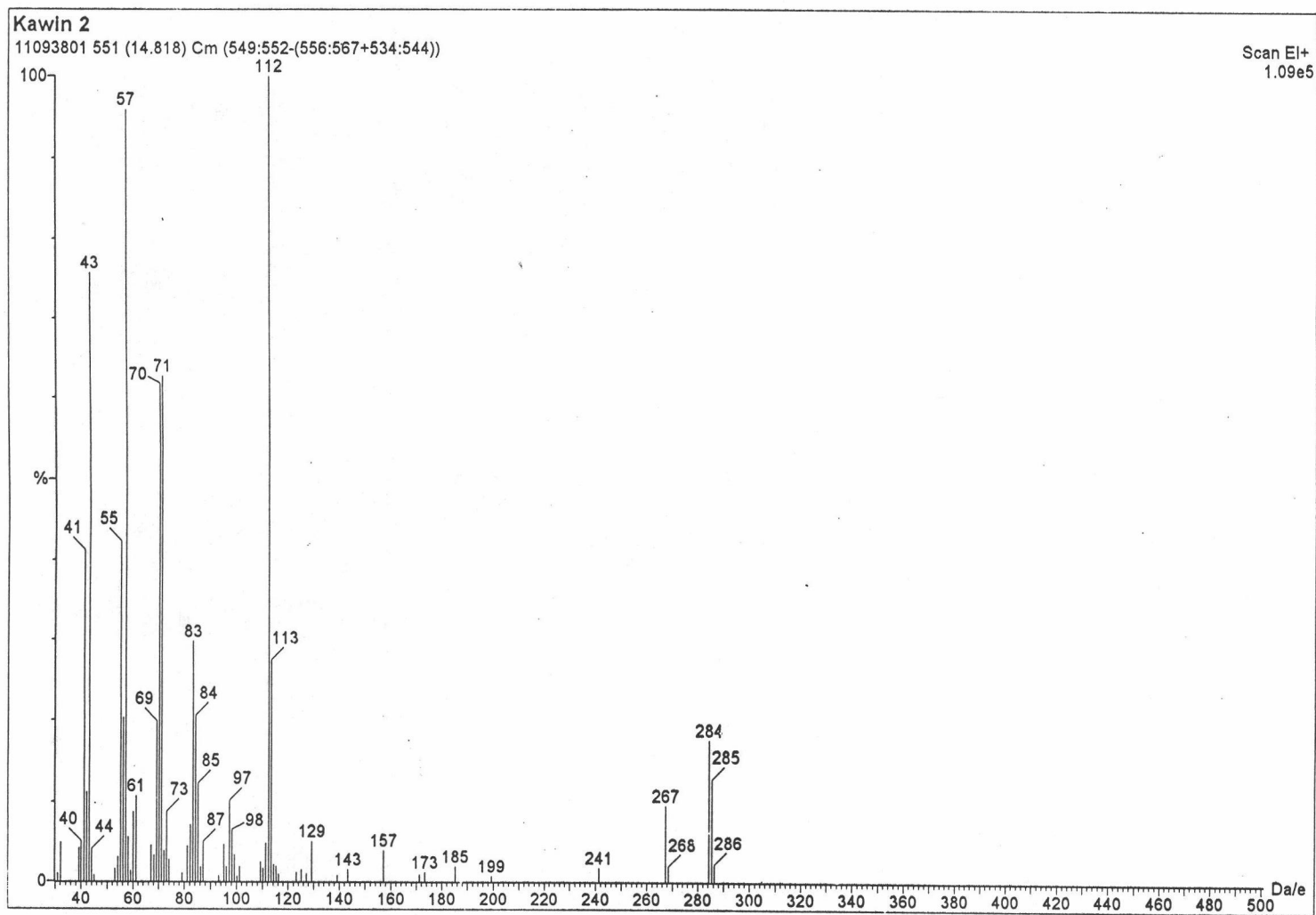


Figure A41 : Mass spectrum of 2-ethylhexyl stearate at retention time 14.82 in Figure A39

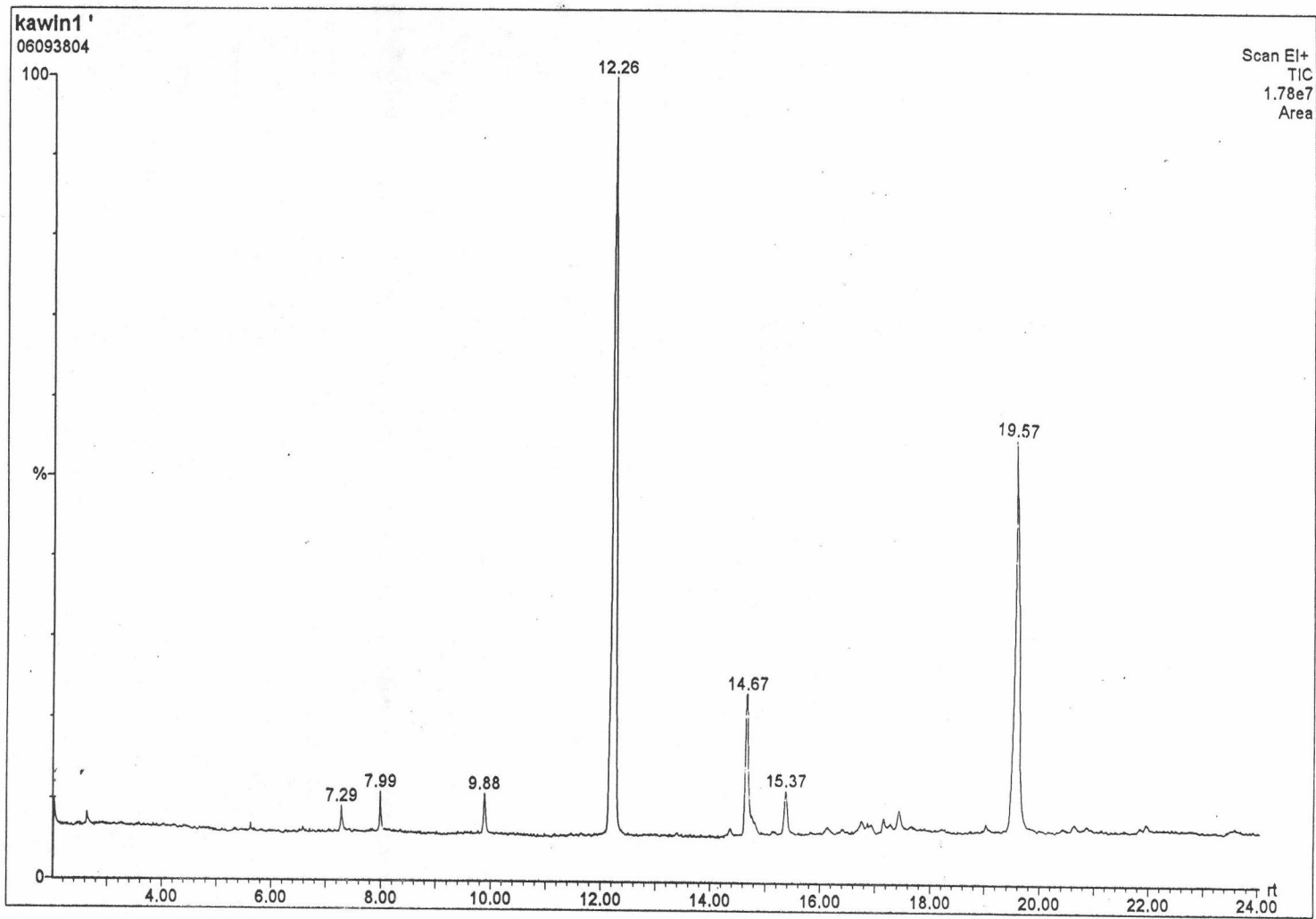


Figure A42 : GC-chromatogram of hydroxylation of 2-ethylhexyl ester

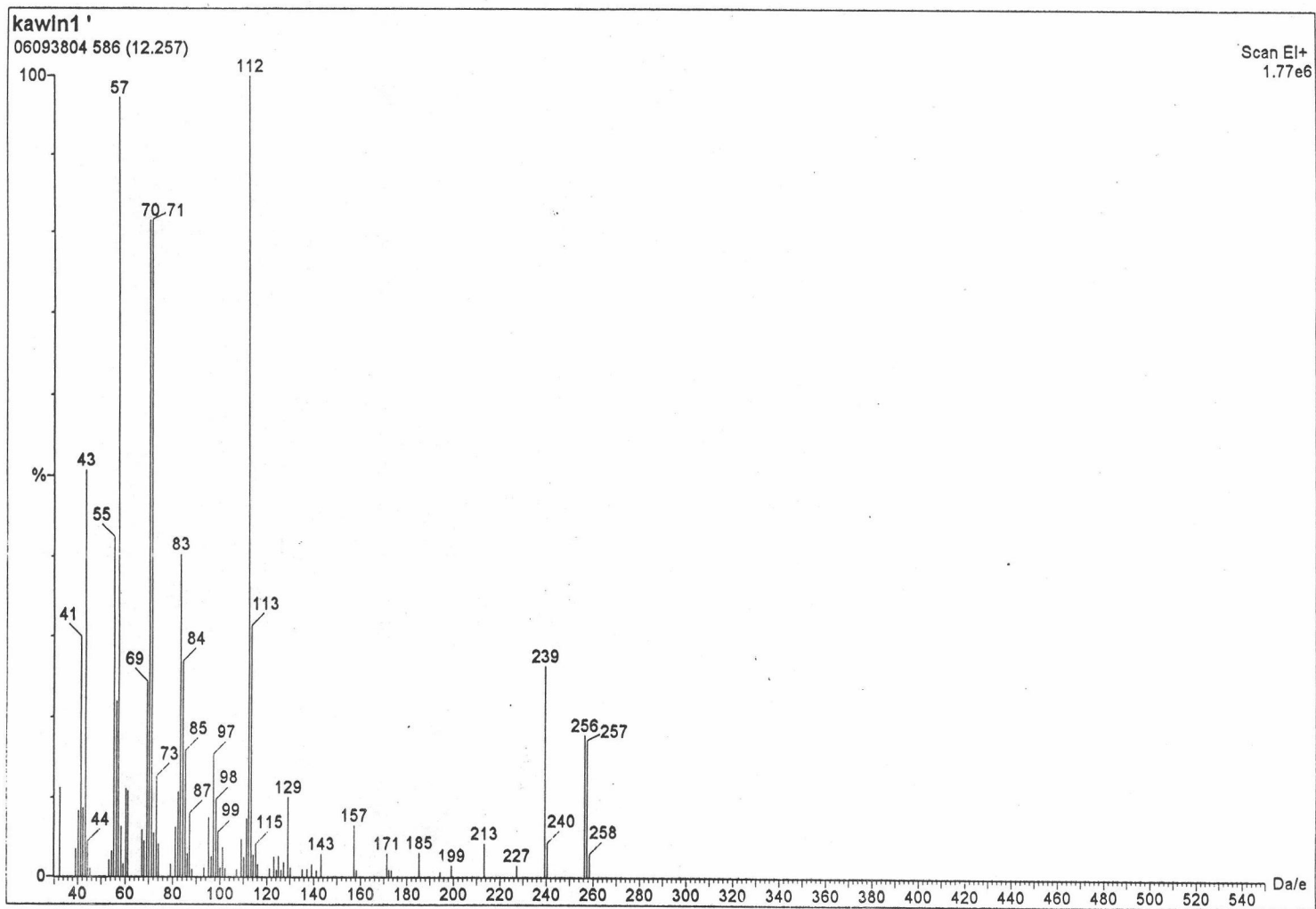


Figure A43 : Mass spectrum of 2-ethylhexyl palmitate at retention time 12.26 in Figure A42

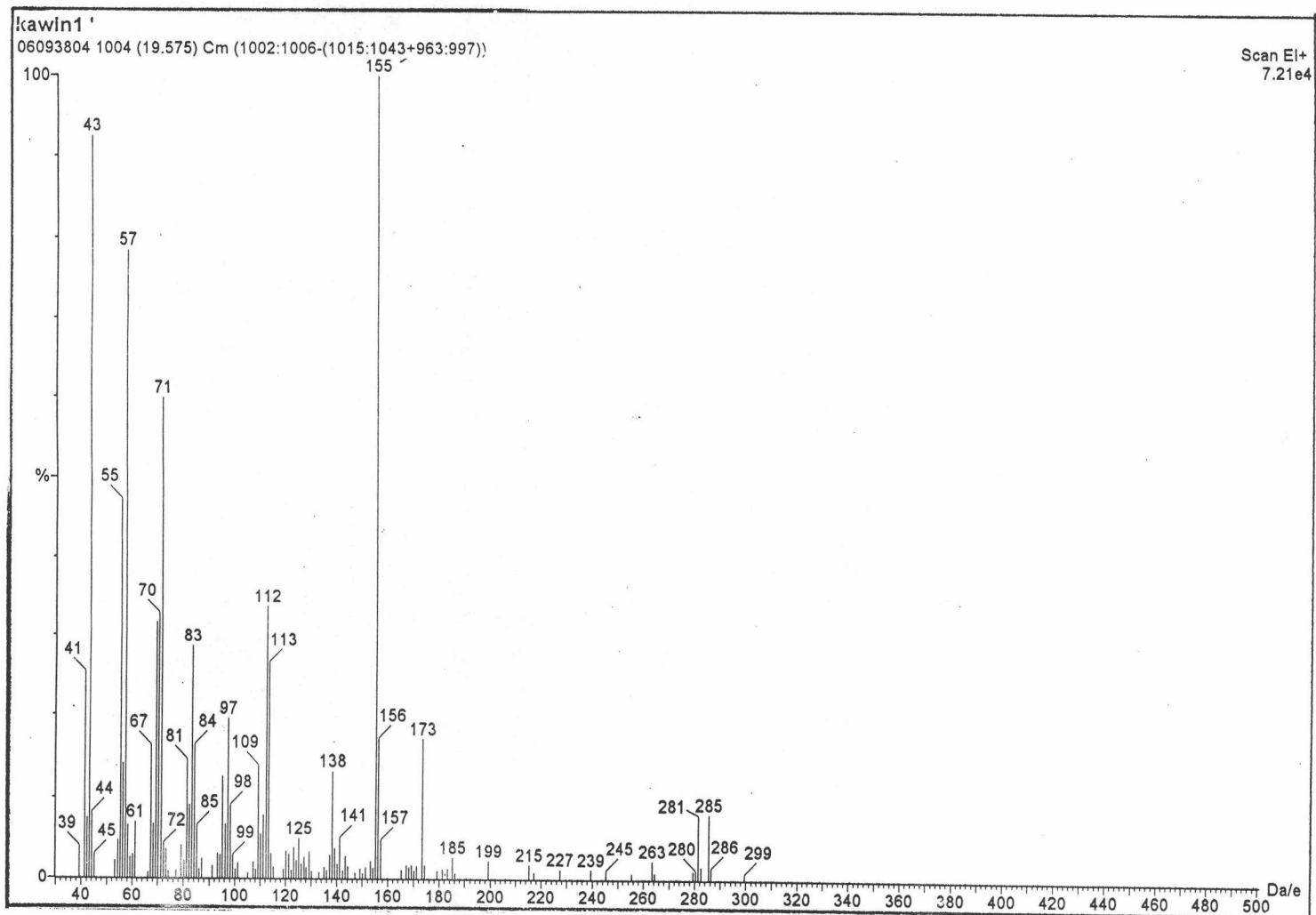


Figure A44 : Mass spectrum of 2-ethylhexyl-9,10-hydroxy stearate at retention time 19.57 in Figure A42

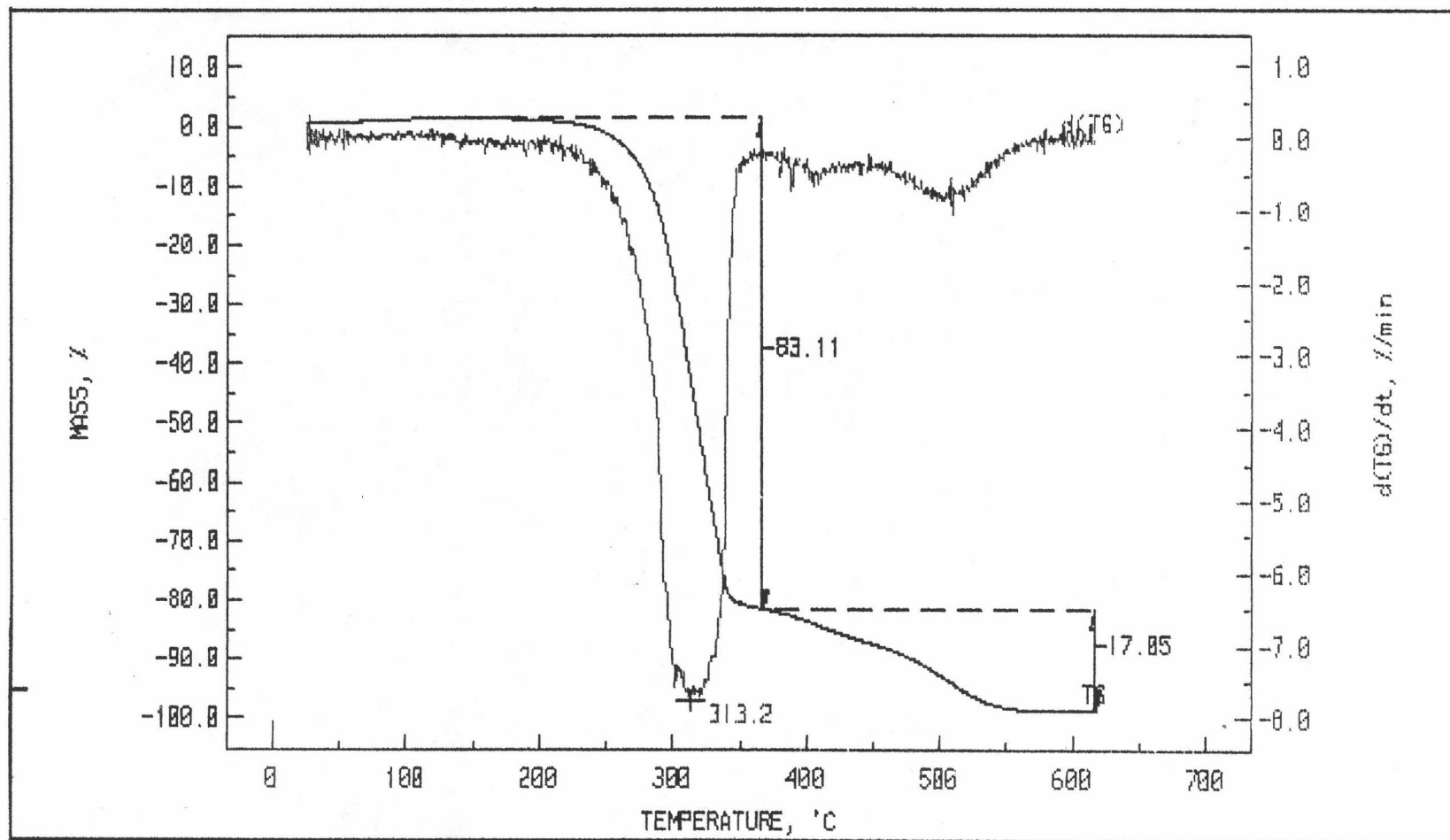


Figure A45 : Thermogram of lubricating base oil (150SN)

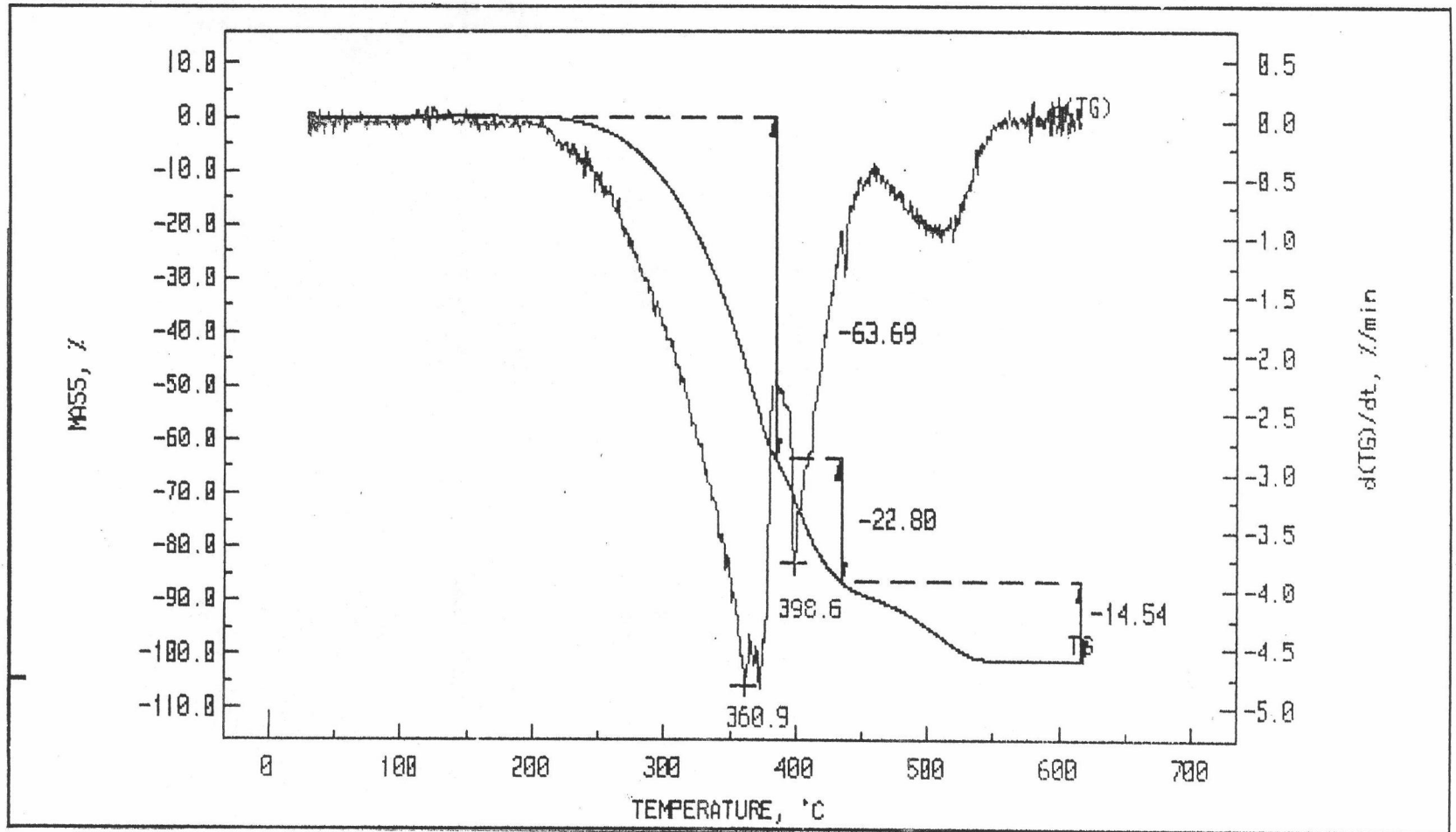


Figure A46 : Thermogram of palm oil

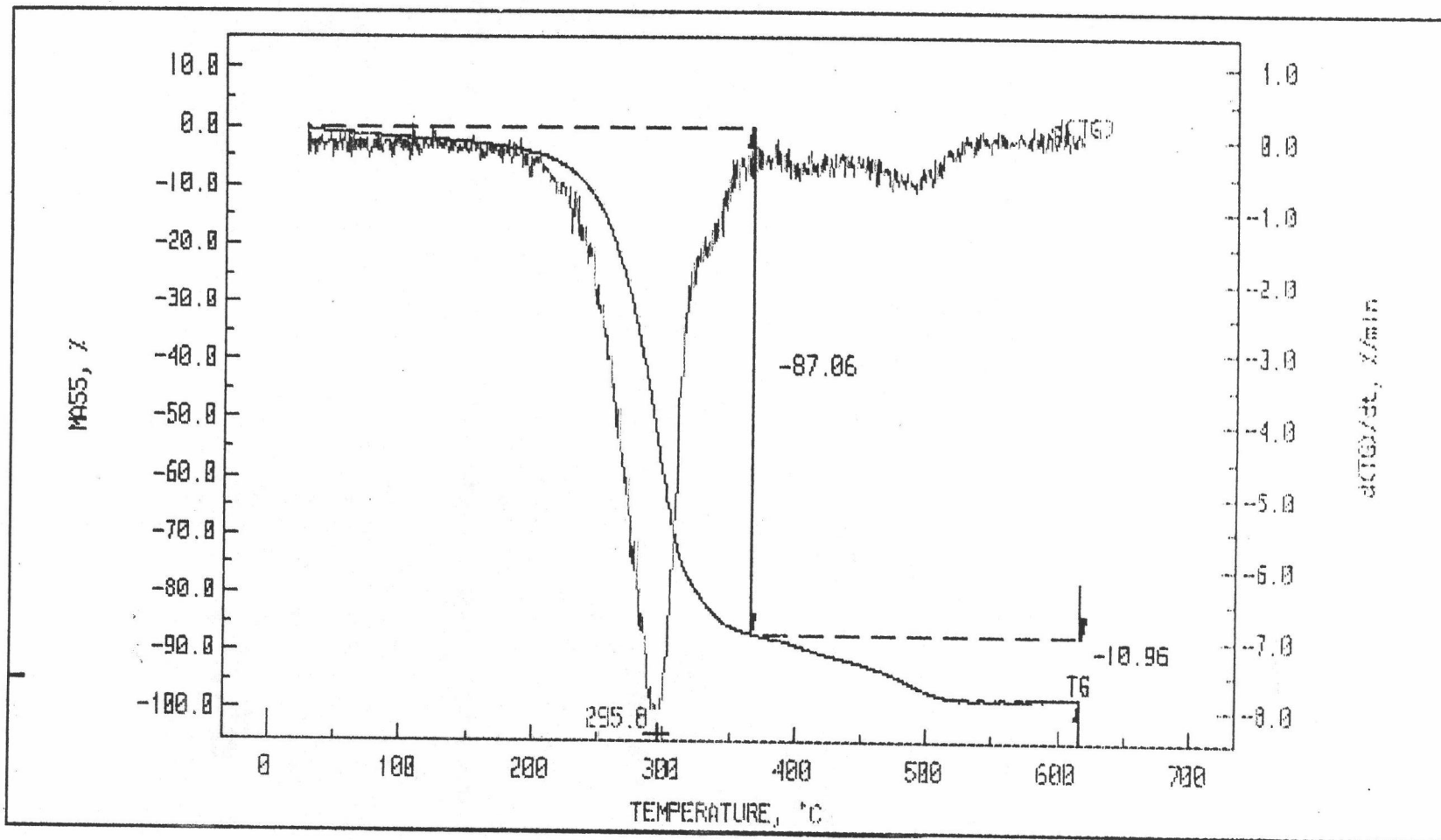


Figure A47 : Thermogram of butyl ester

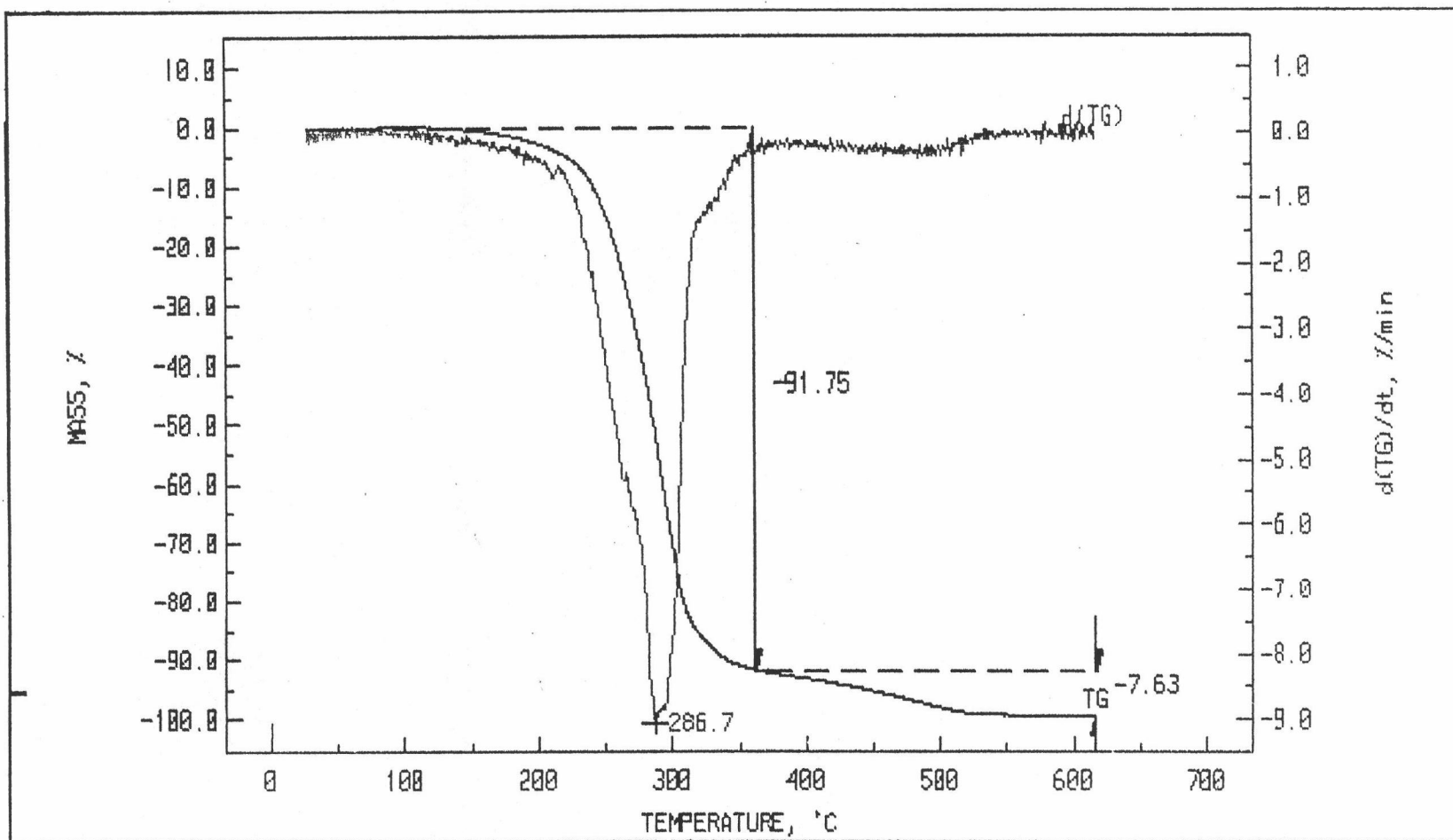


Figure A48 : Thermogram of hydrogenated butyl ester

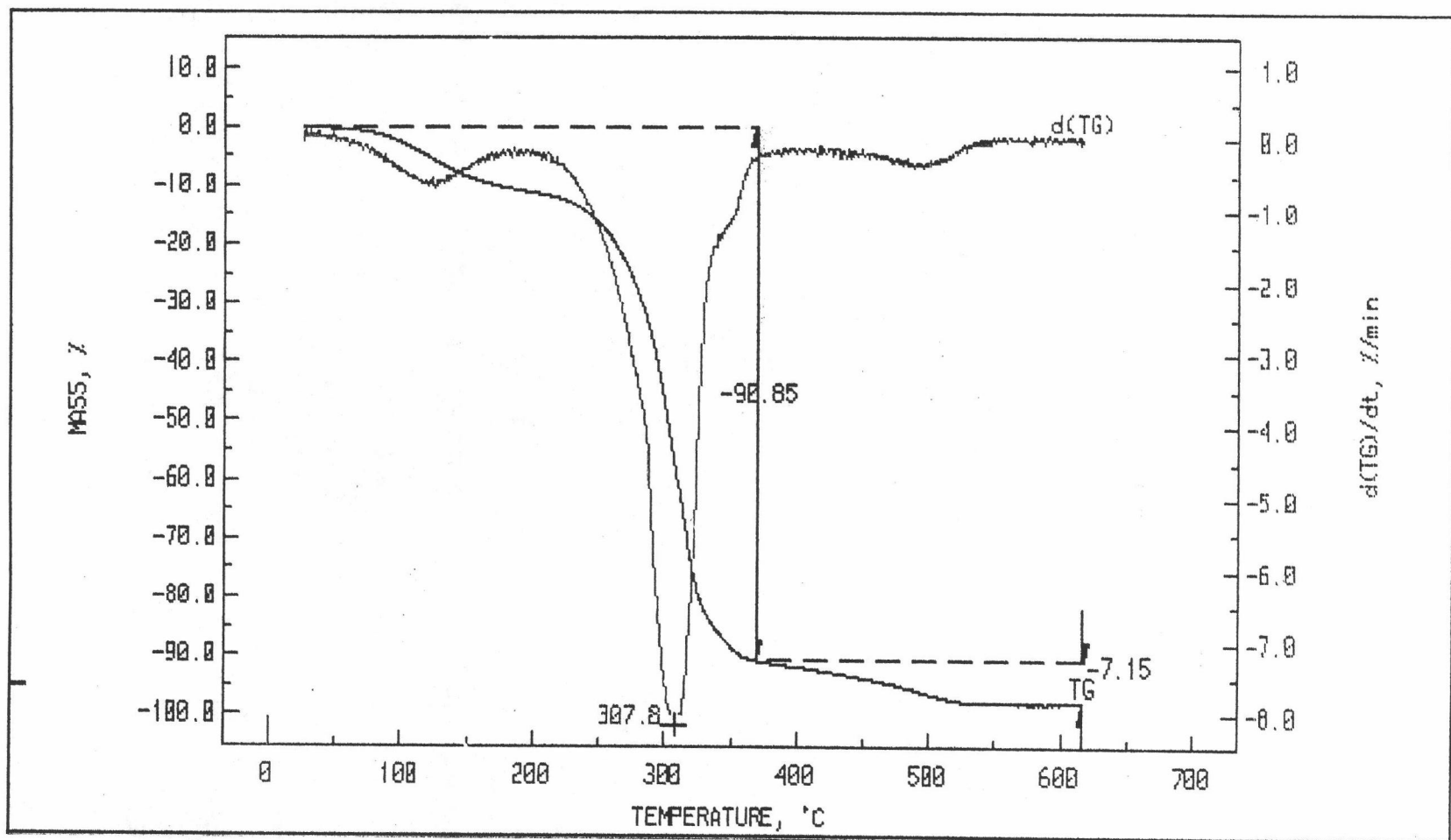


Figure A49 : Thermogram of hexyl ester

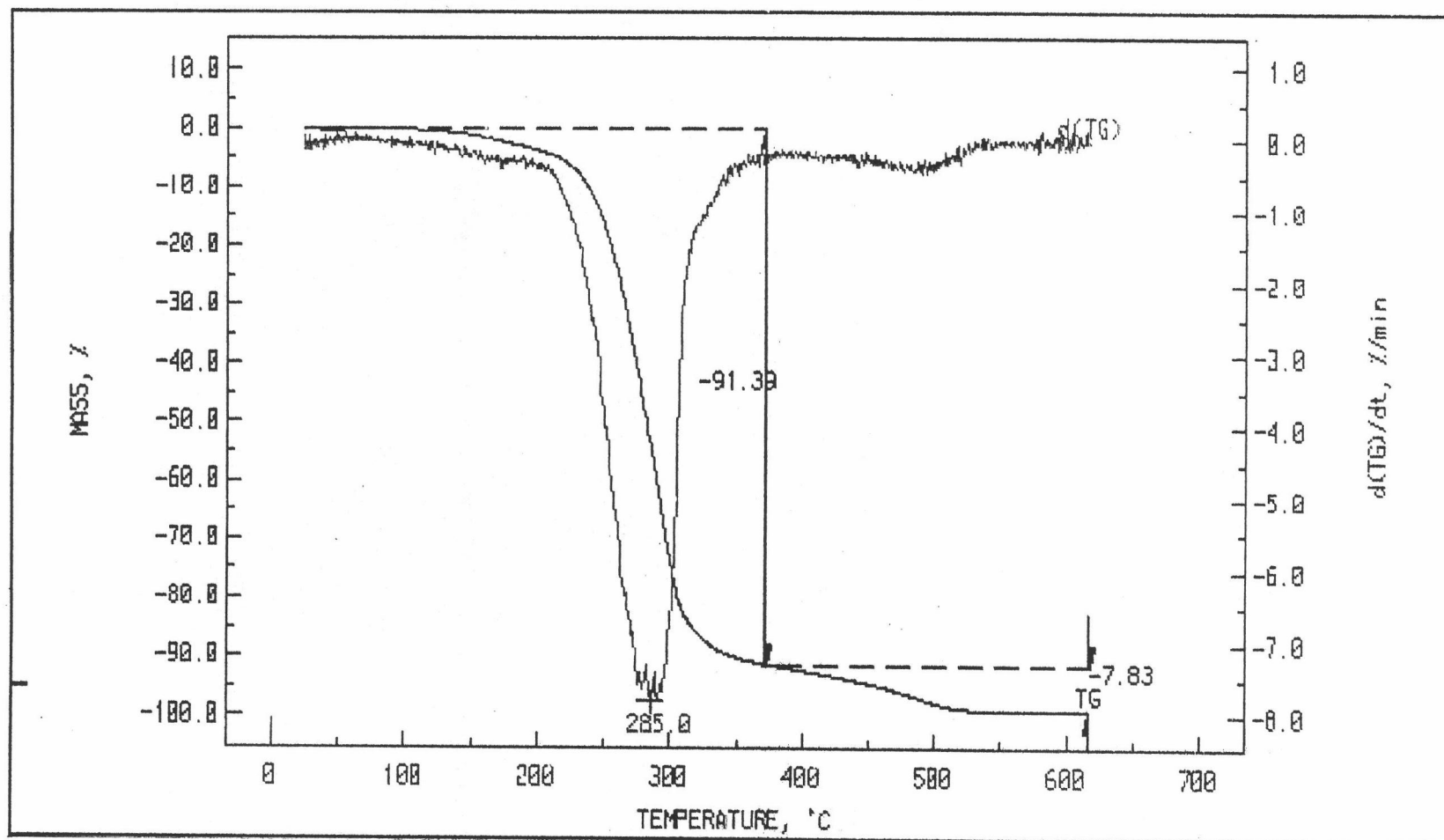


Figure A50 : Thermogram of hydrogenated hexyl ester

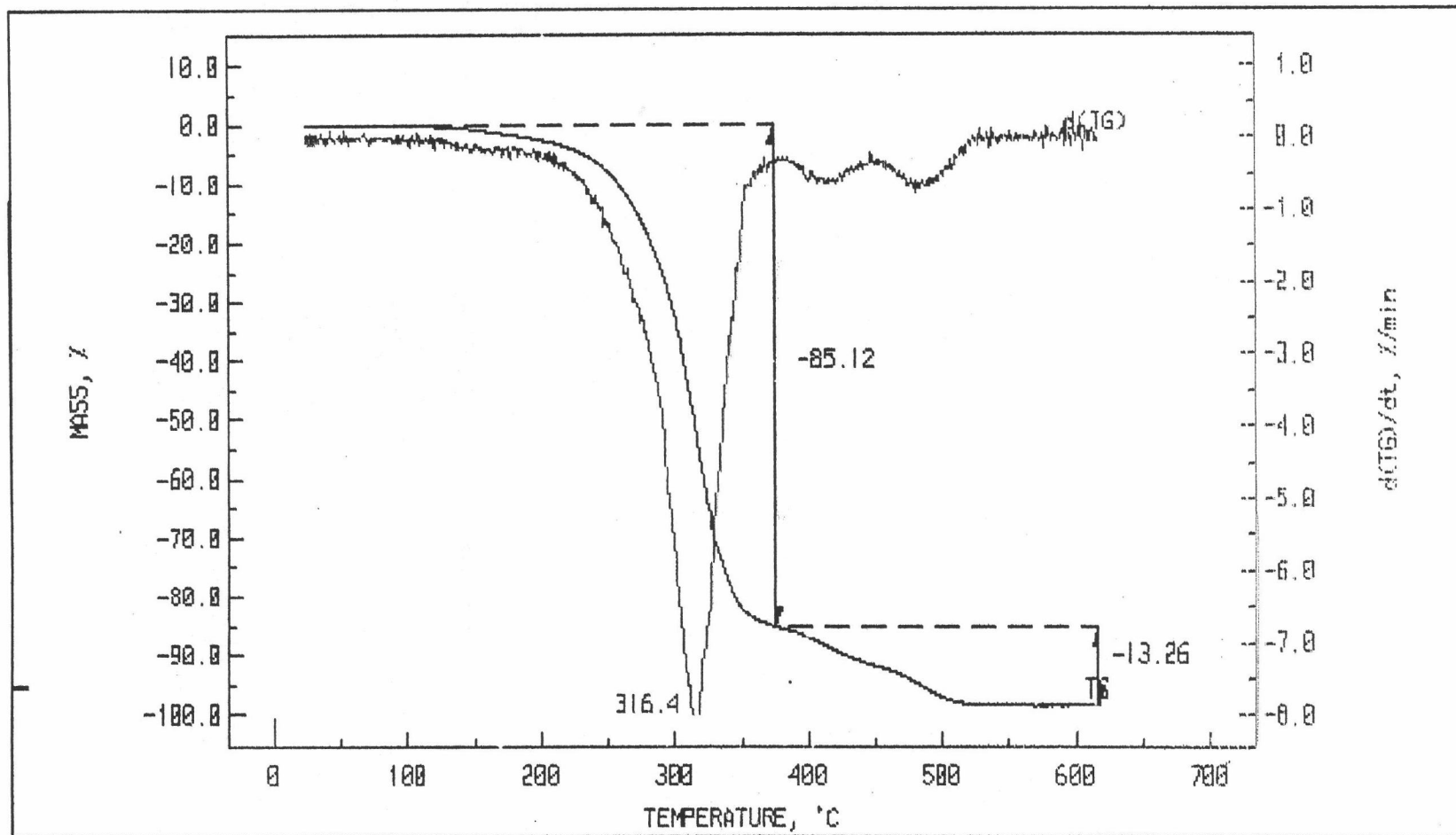


Figure A51 : Thermogram of cyclohexyl ester

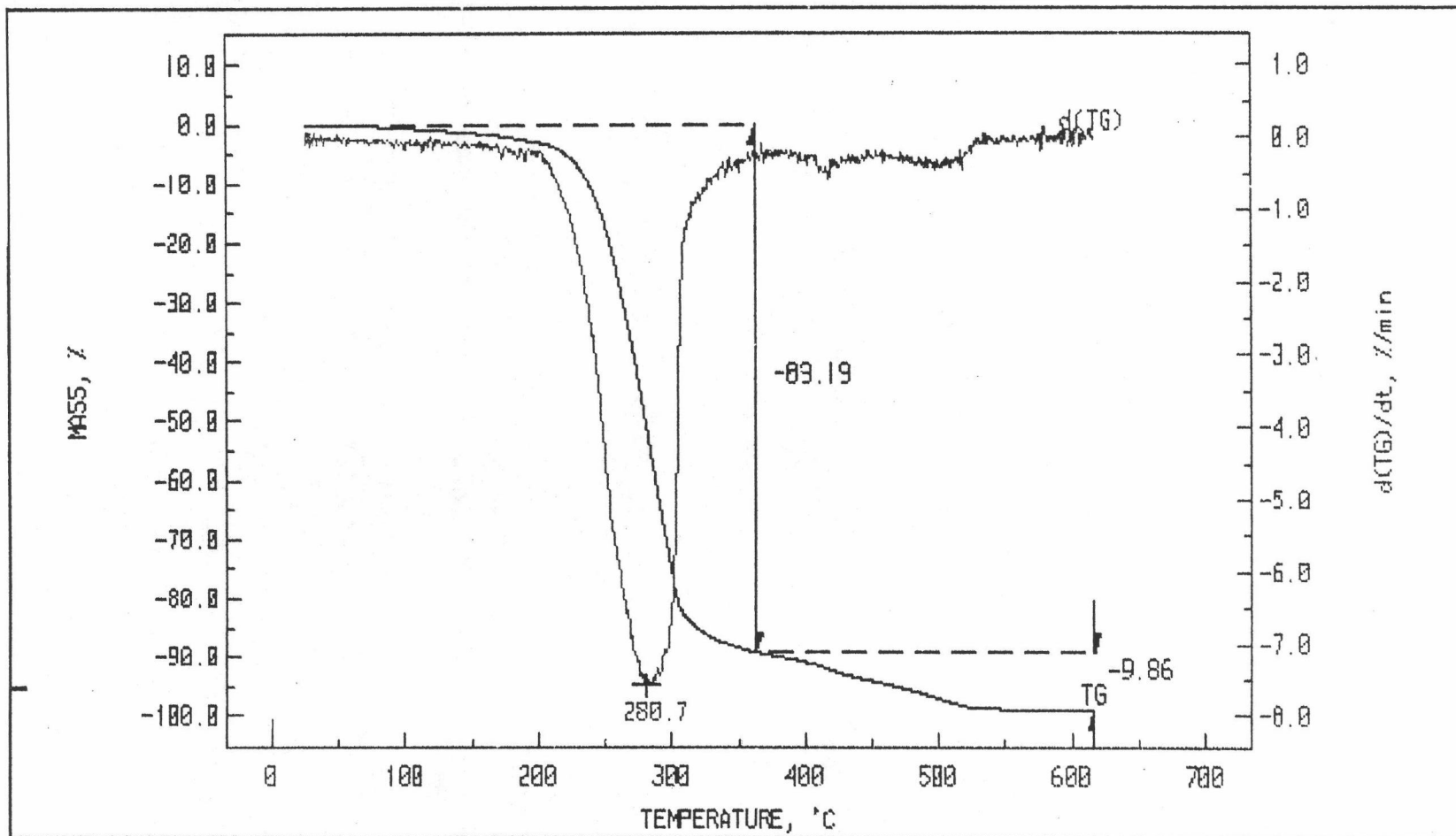


Figure A52 : Thermogram of hydrogenated cyclohexyl ester

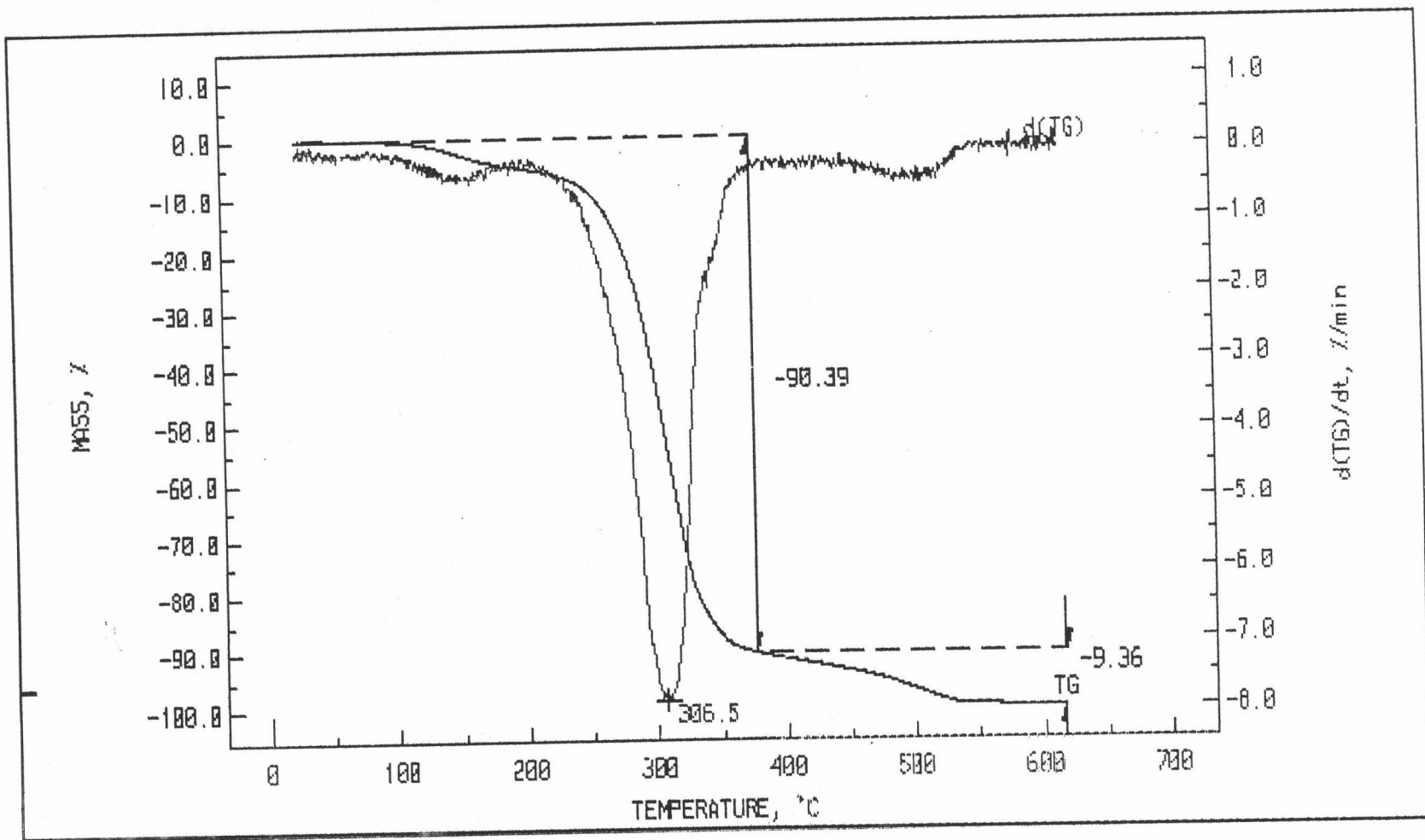


Figure A53 : Thermogram of 2-ethylhexyl ester

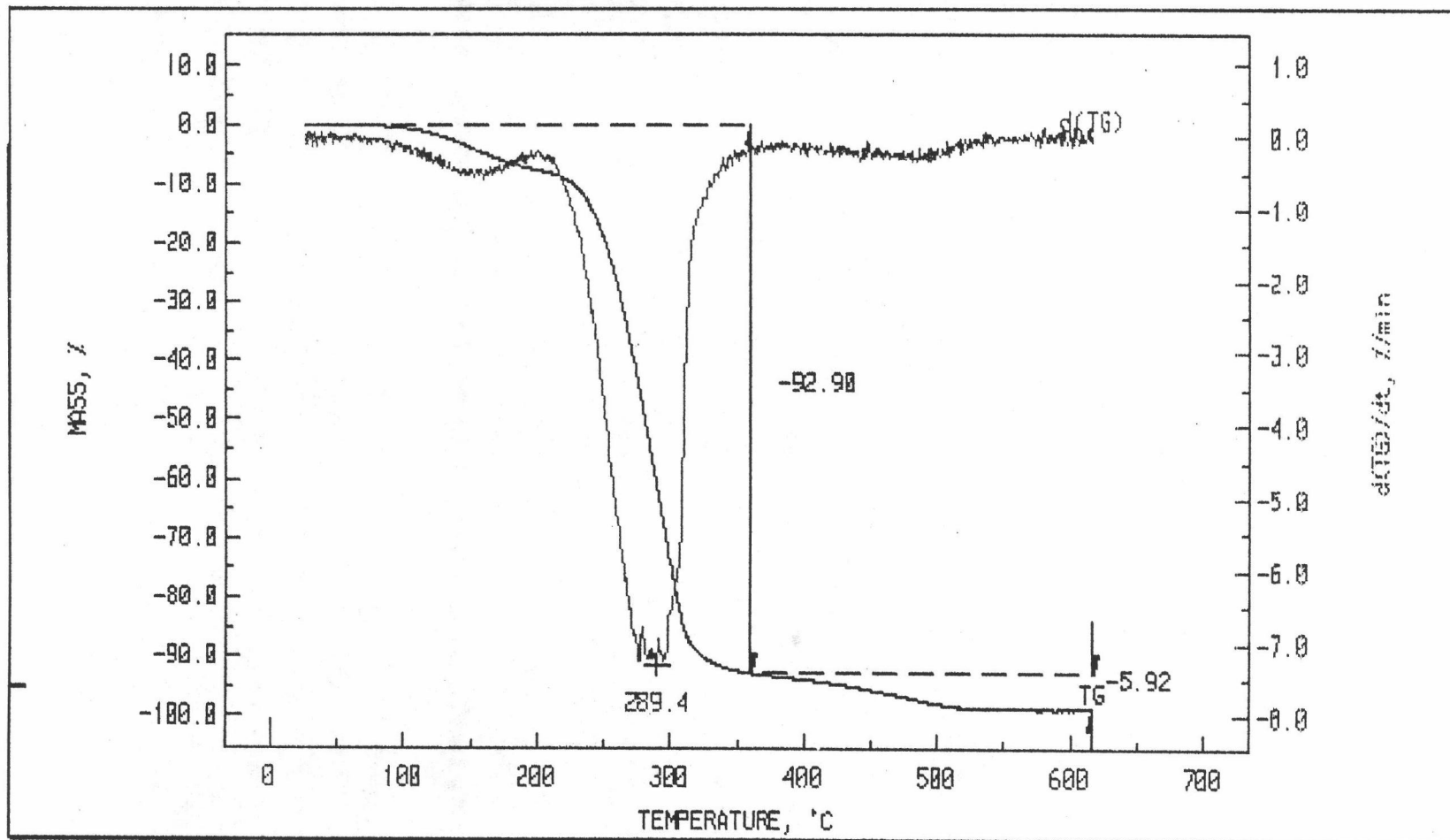


Figure A54 : Thermogram of hydrogenated 2-ethylhexyl ester

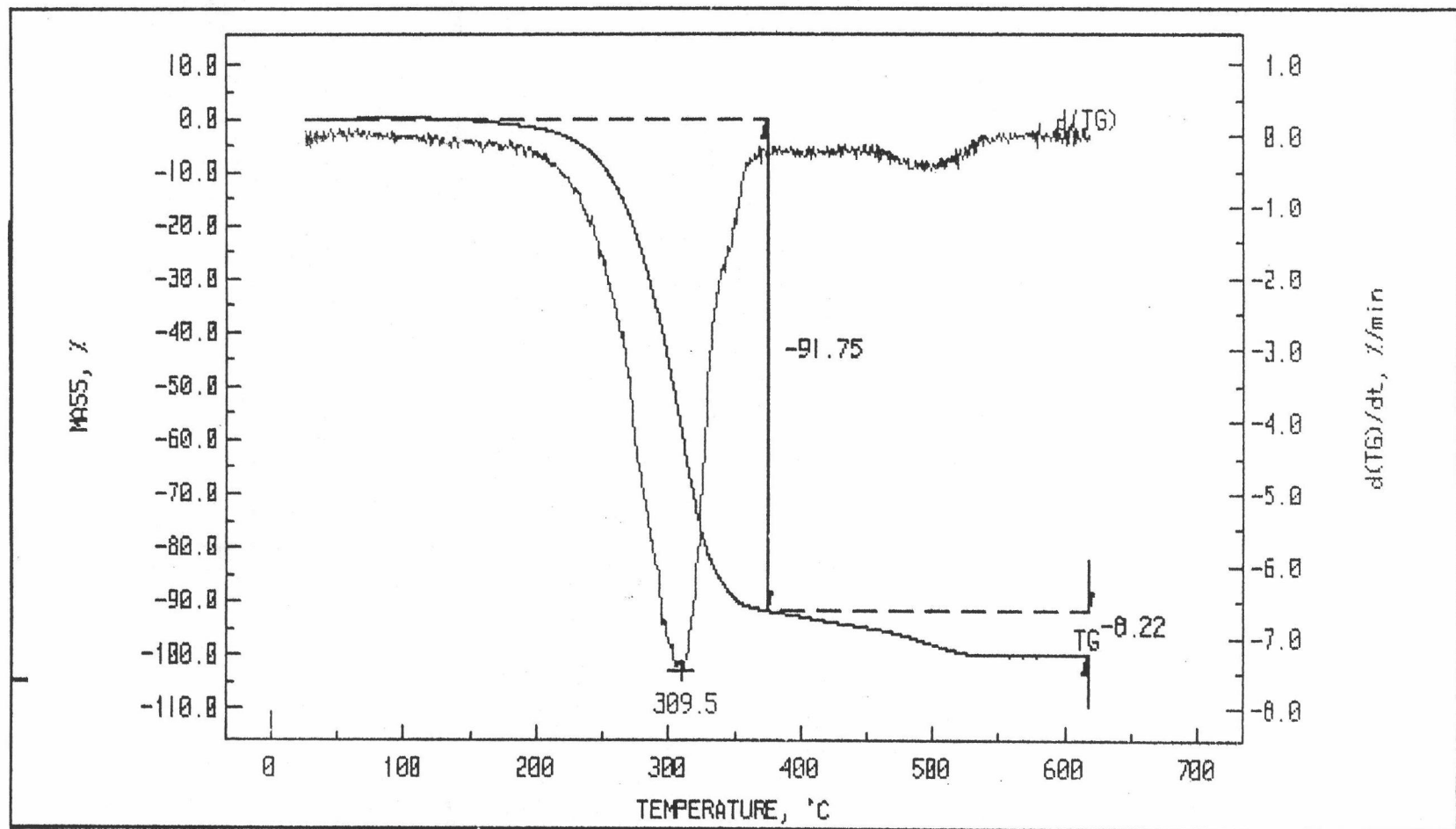


Figure A55 : Thermogram of 2-ethylhexyl ester obtained from Hydroxylation

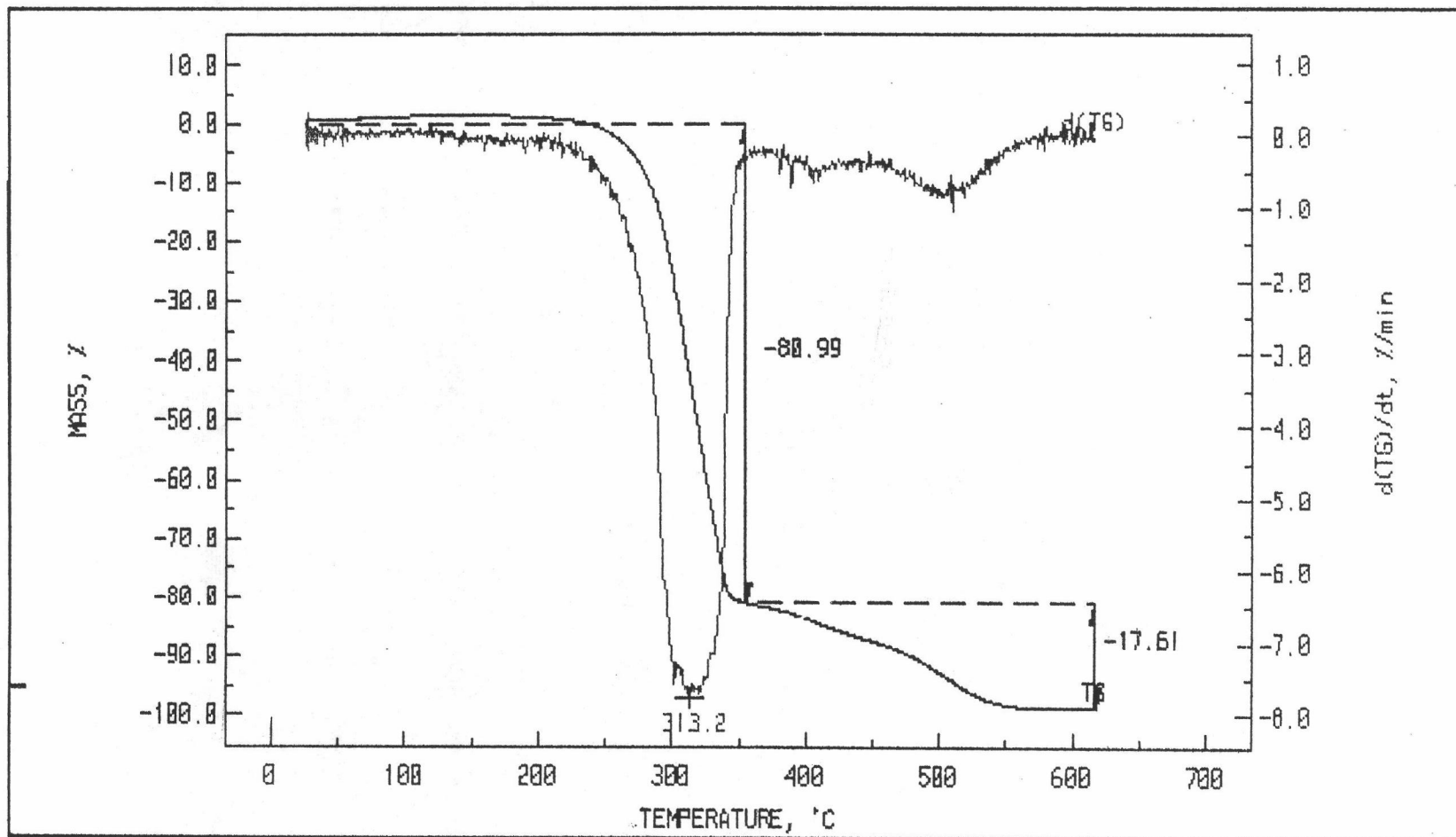


Figure A56 : Thermogram of lubricating base oil (150SN) blend with 22%wt hydrogenated butyl ester



VITA

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