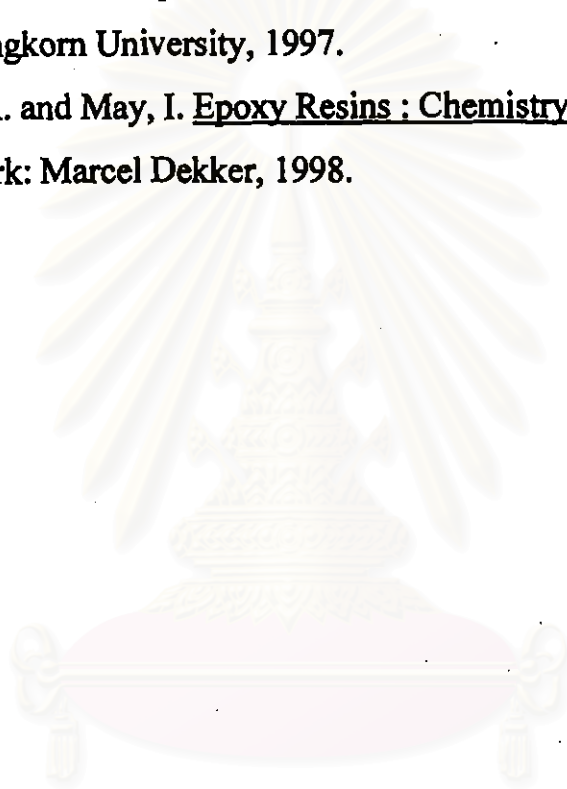


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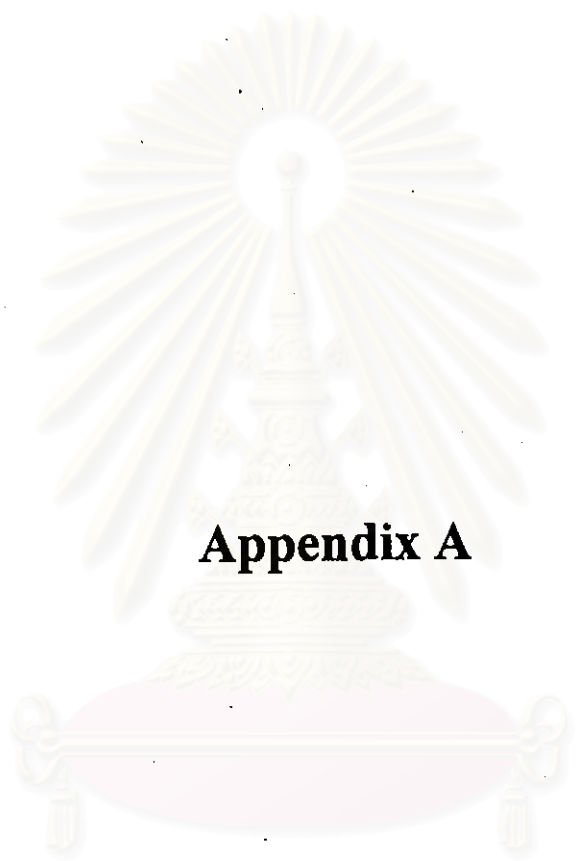
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สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย



Appendix A

สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย

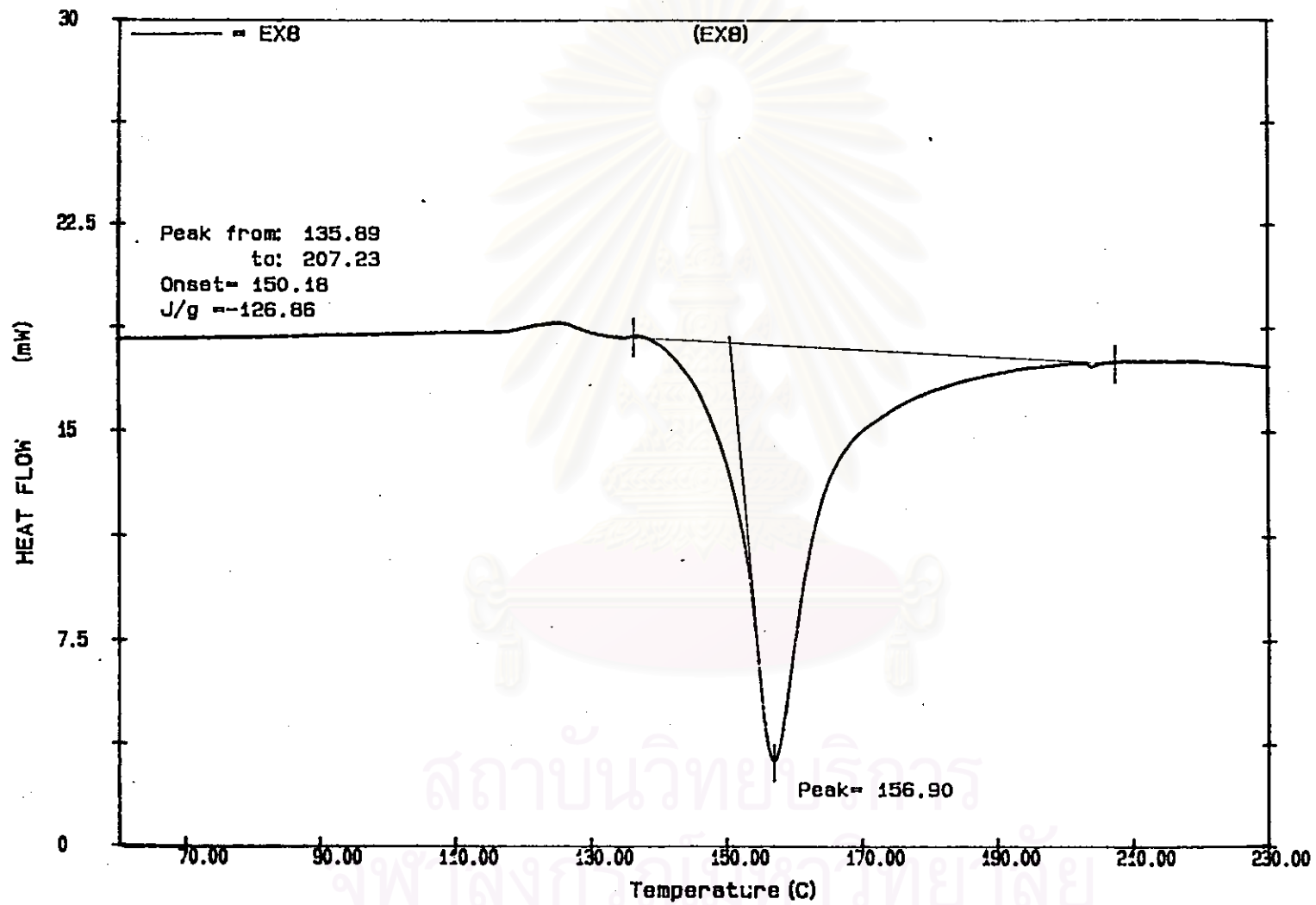


Figure A1 DSC thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.1

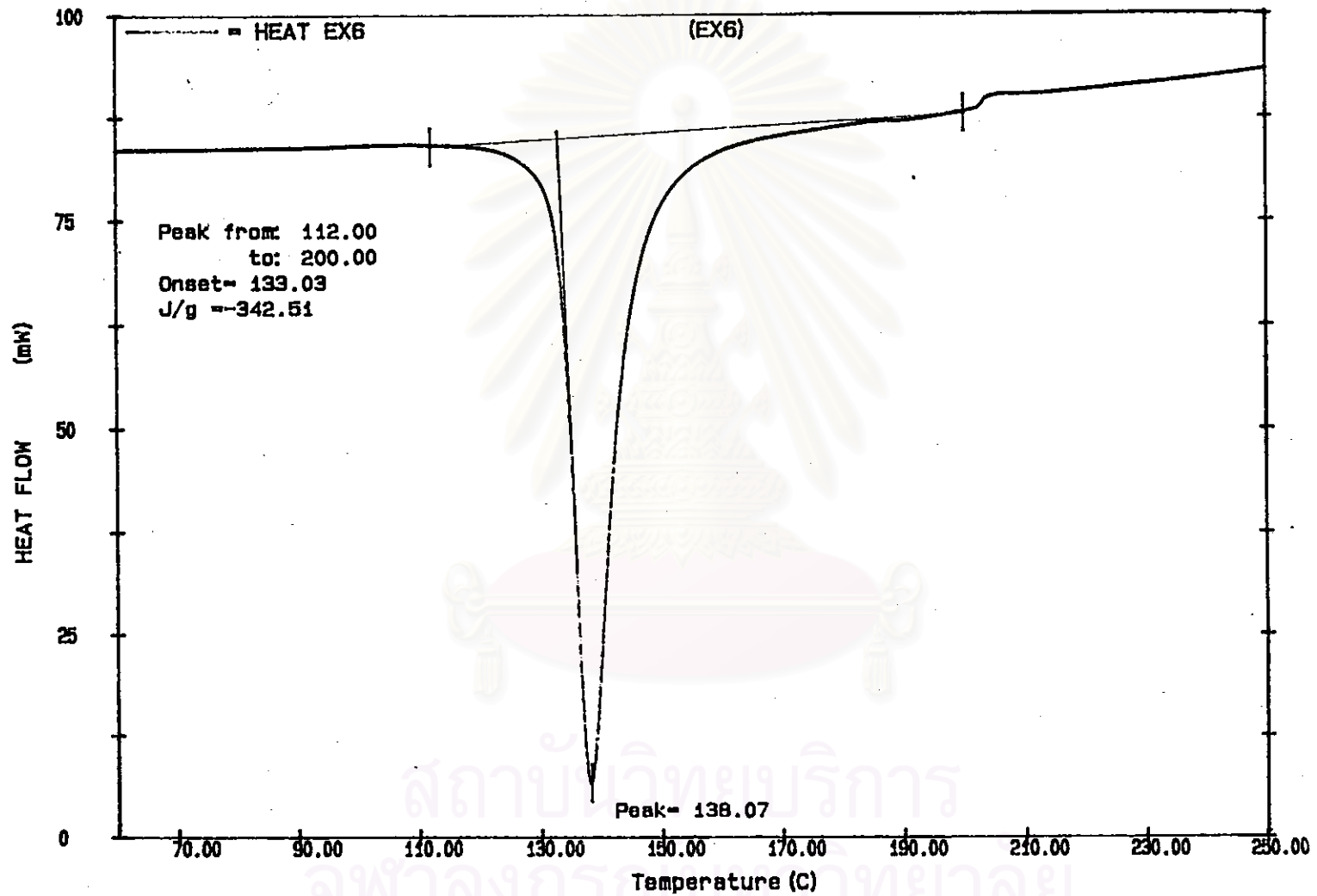


Figure A2 DSC thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.4

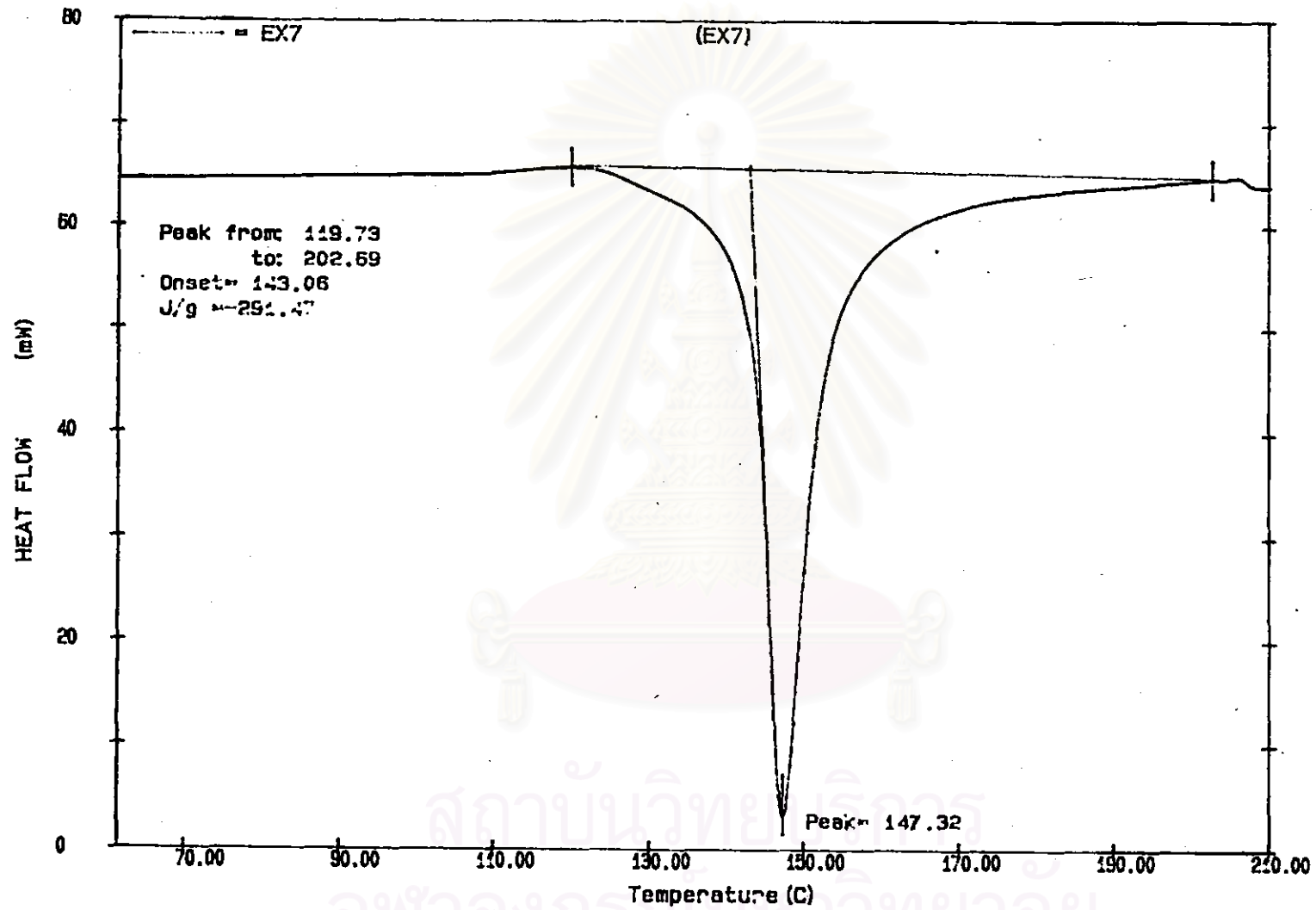


Figure A3 DSC thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 4: 0.2

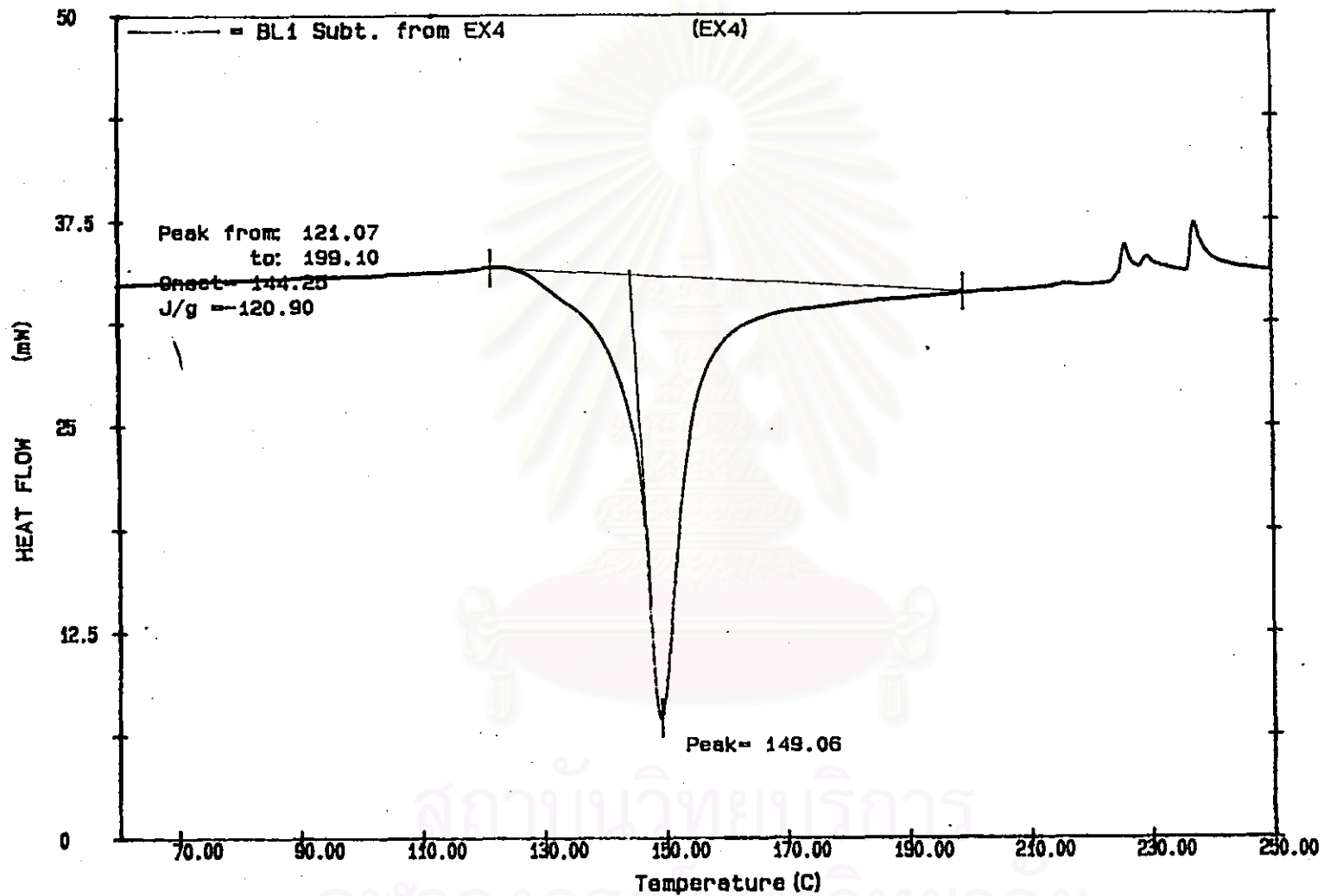


Figure A4 DSC thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 8: 0.2

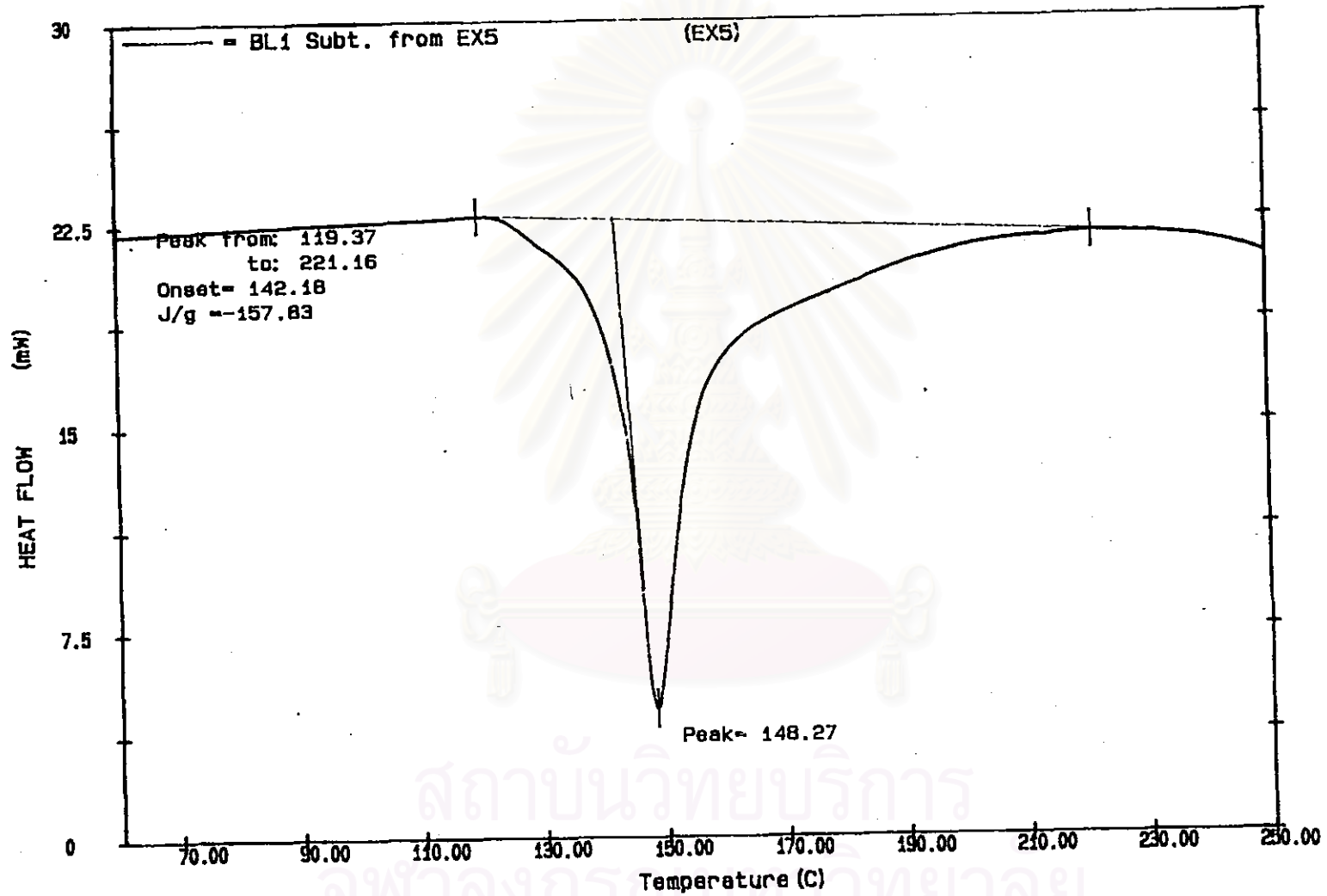


Figure A5 DSC thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 10: 0.2

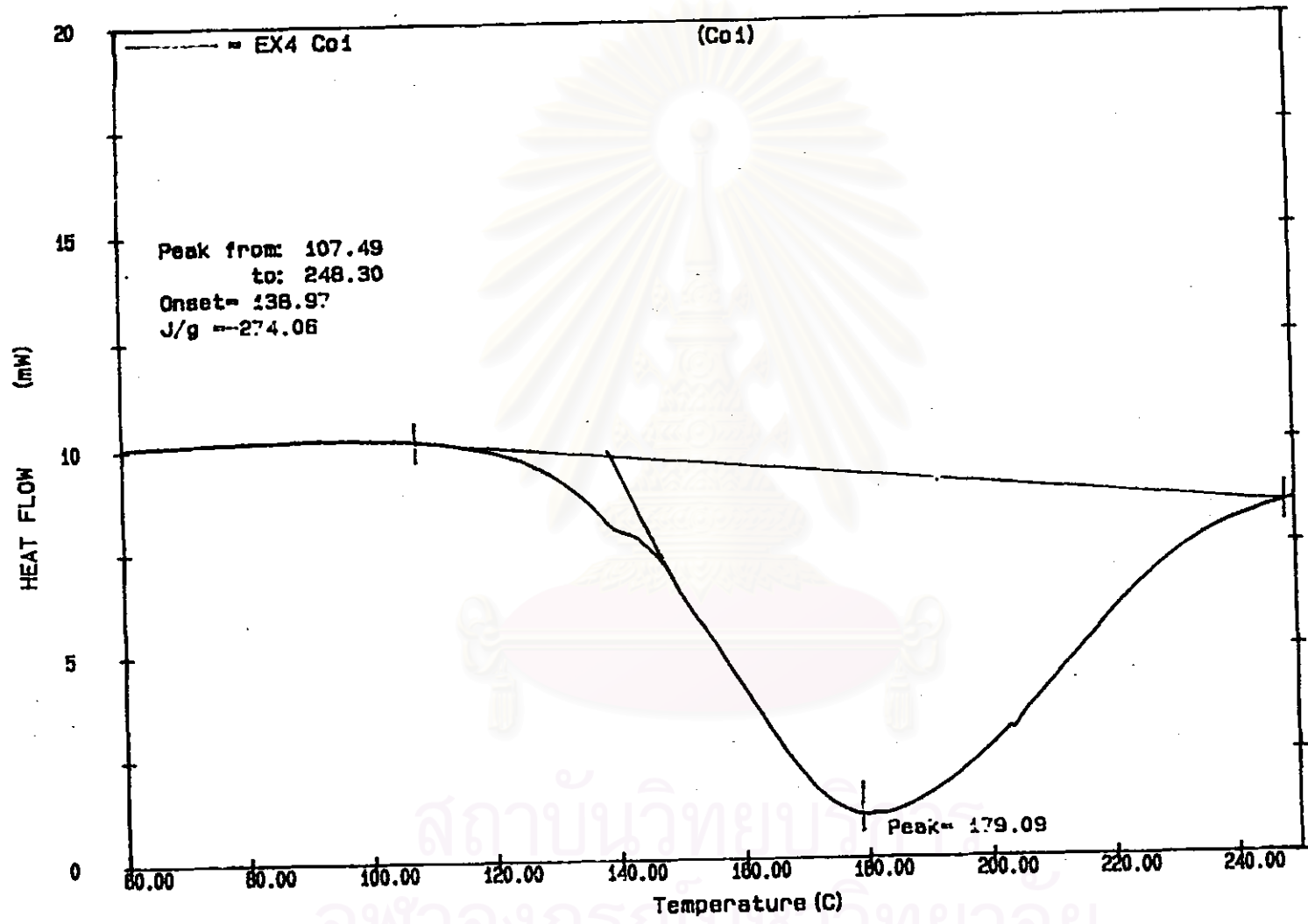


Figure A6 DSC thermogram of CoL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.1

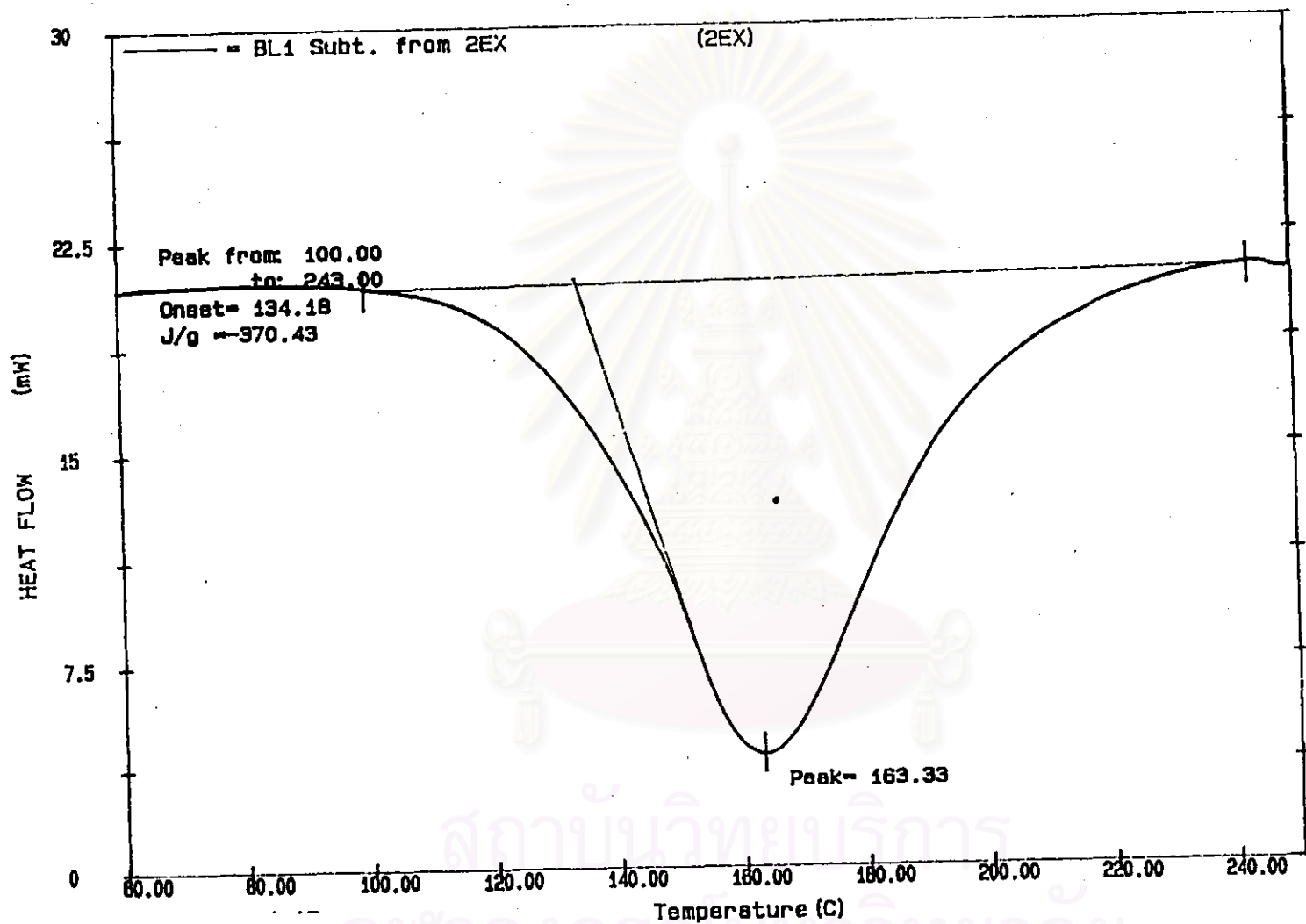


Figure A7 DSC thermogram of CoL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.2

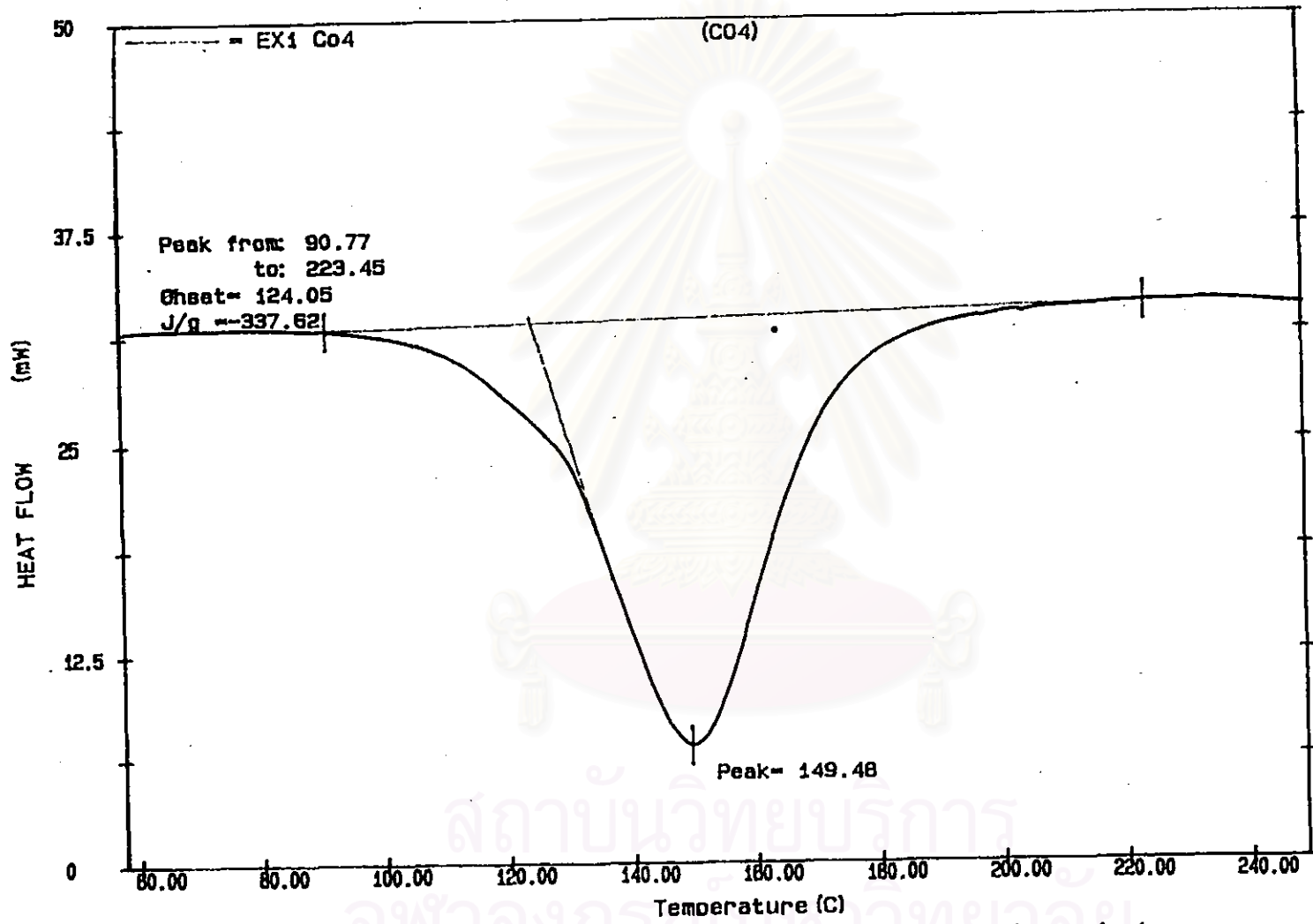


Figure A8 DSC thermogram of CoL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.4

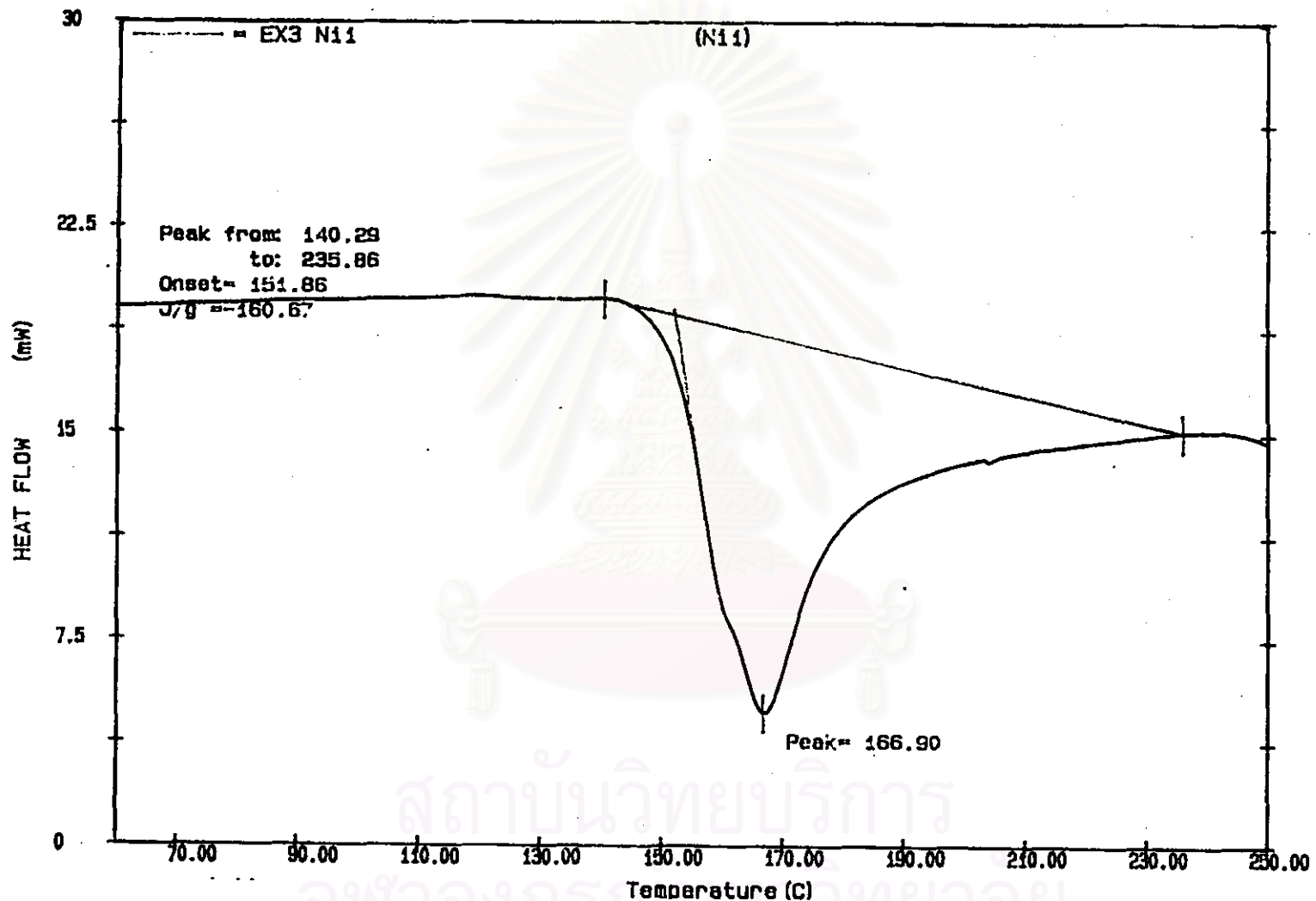


Figure A9 DSC thermogram of NiL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.1

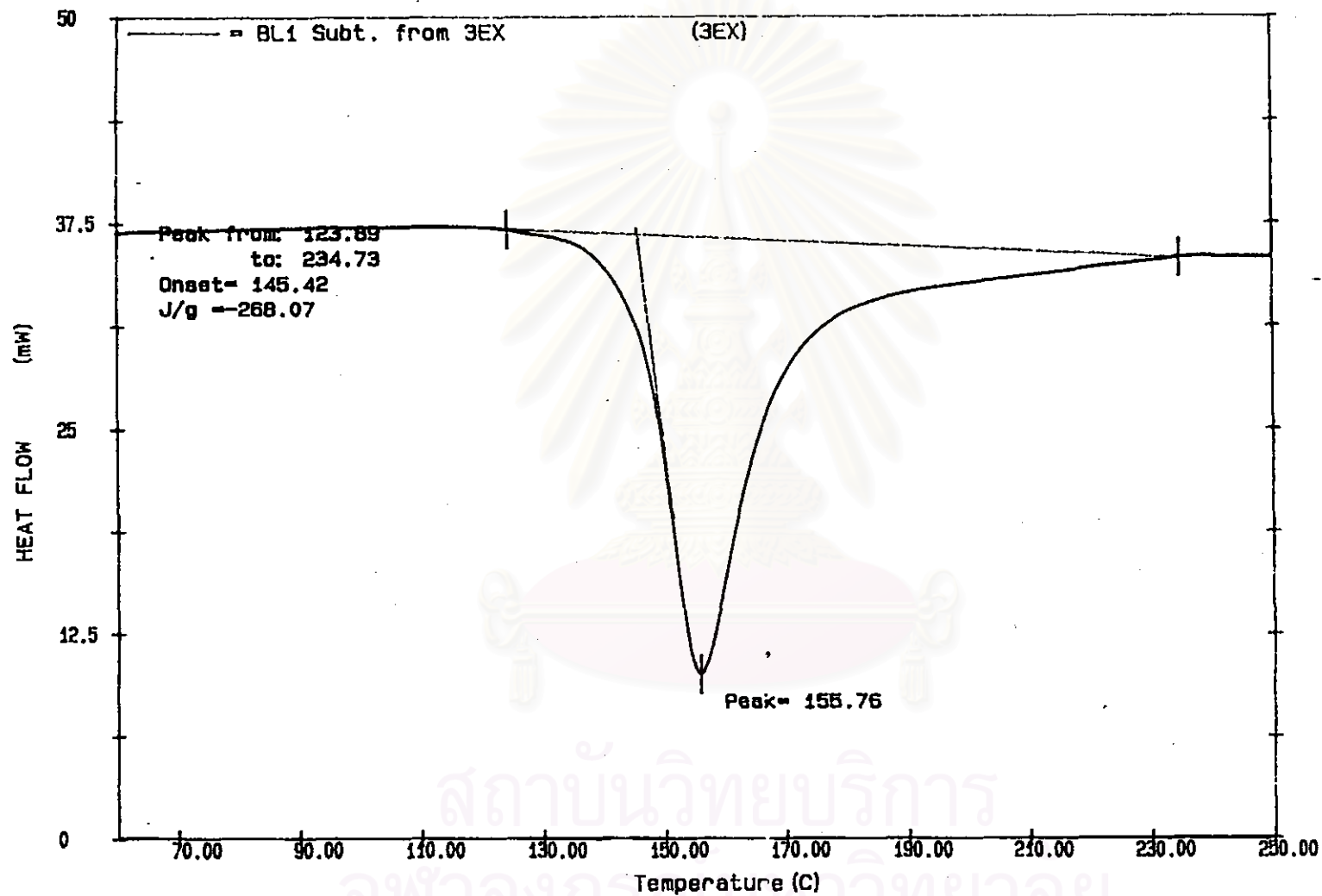


Figure A10 DSC thermogram of NiL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.2

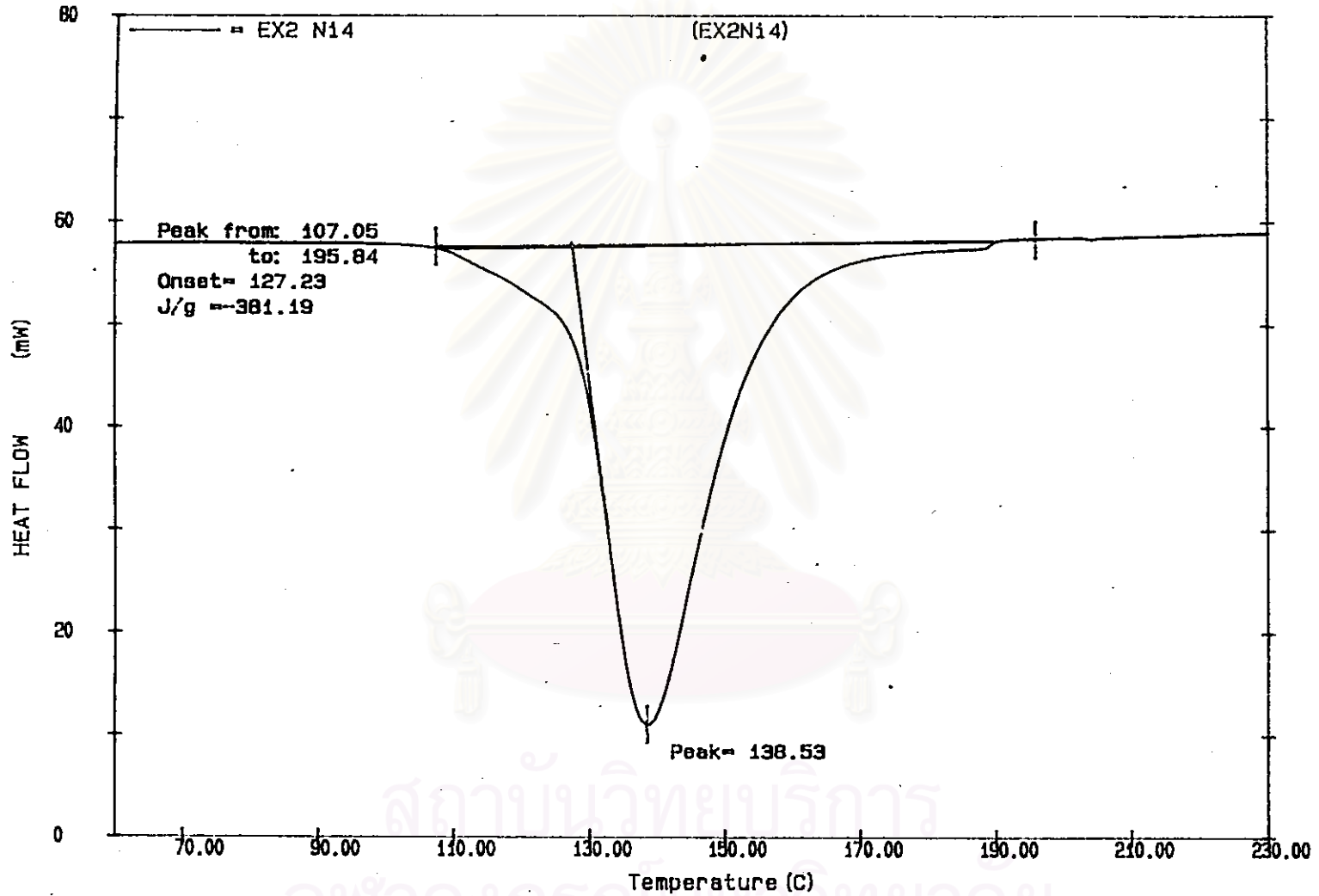


Figure A11 DSC thermogram of NiL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.4

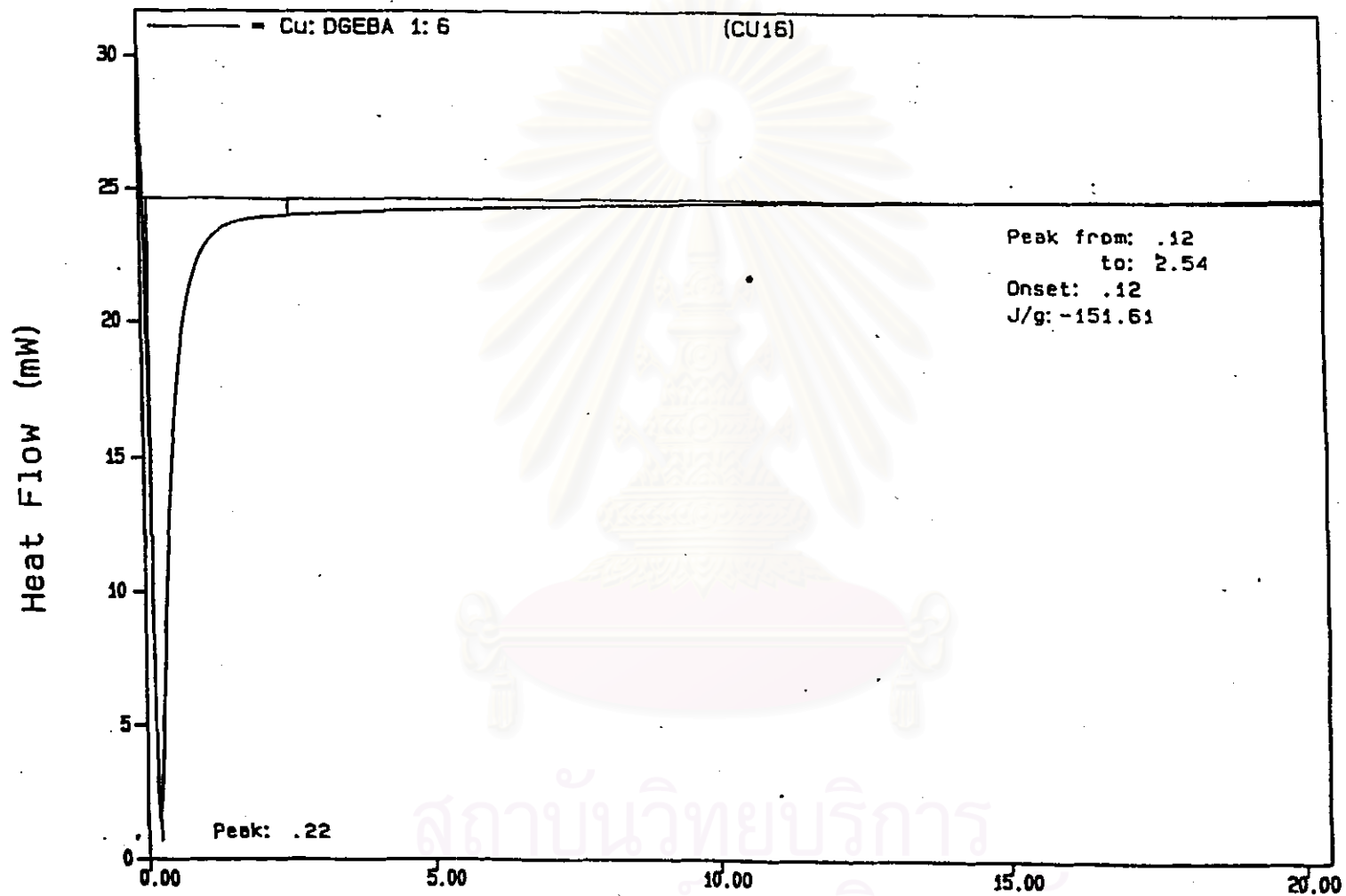


Figure A12 Isothermal DSC thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0

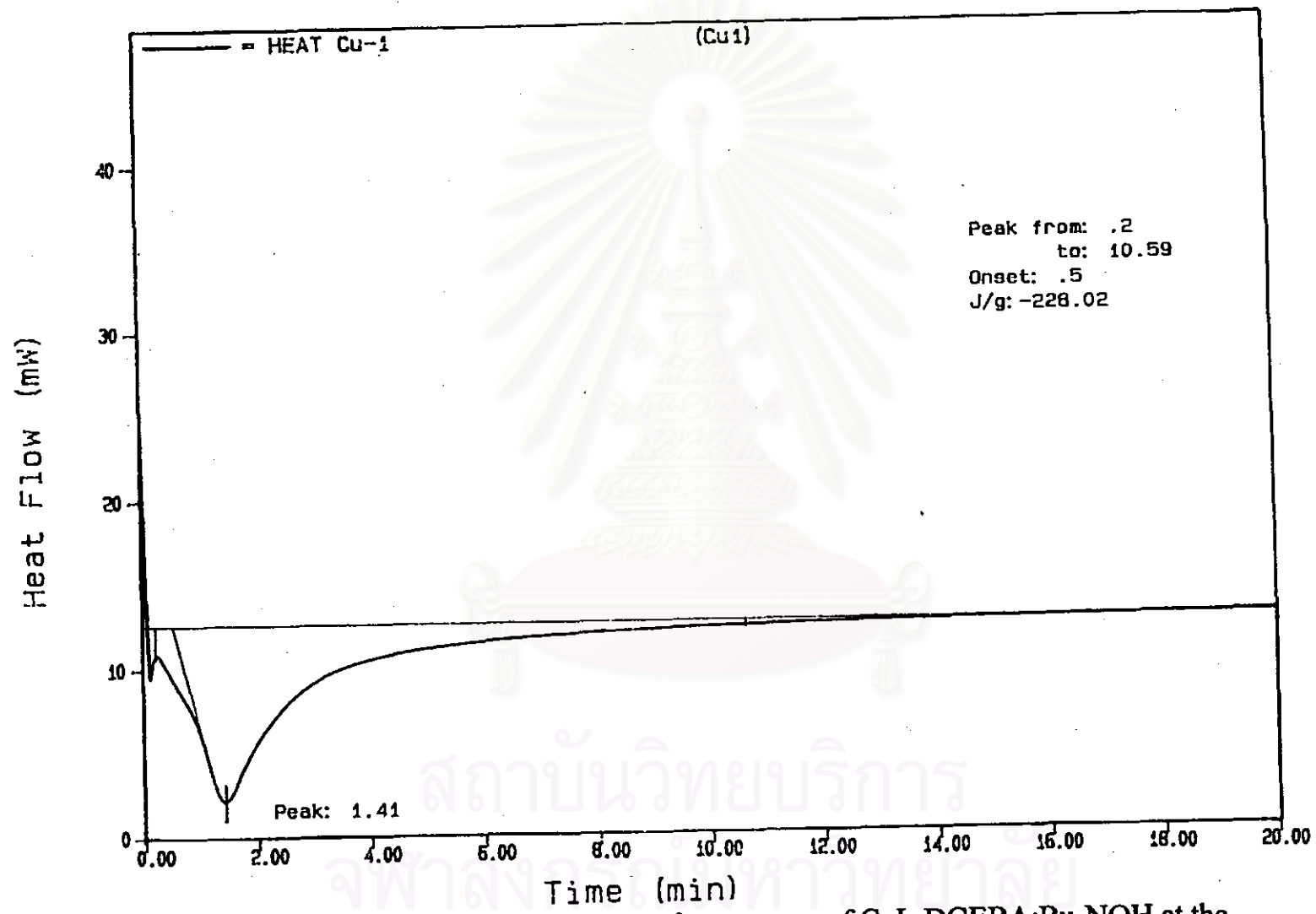


Figure A13 Isothermal DSC thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.1

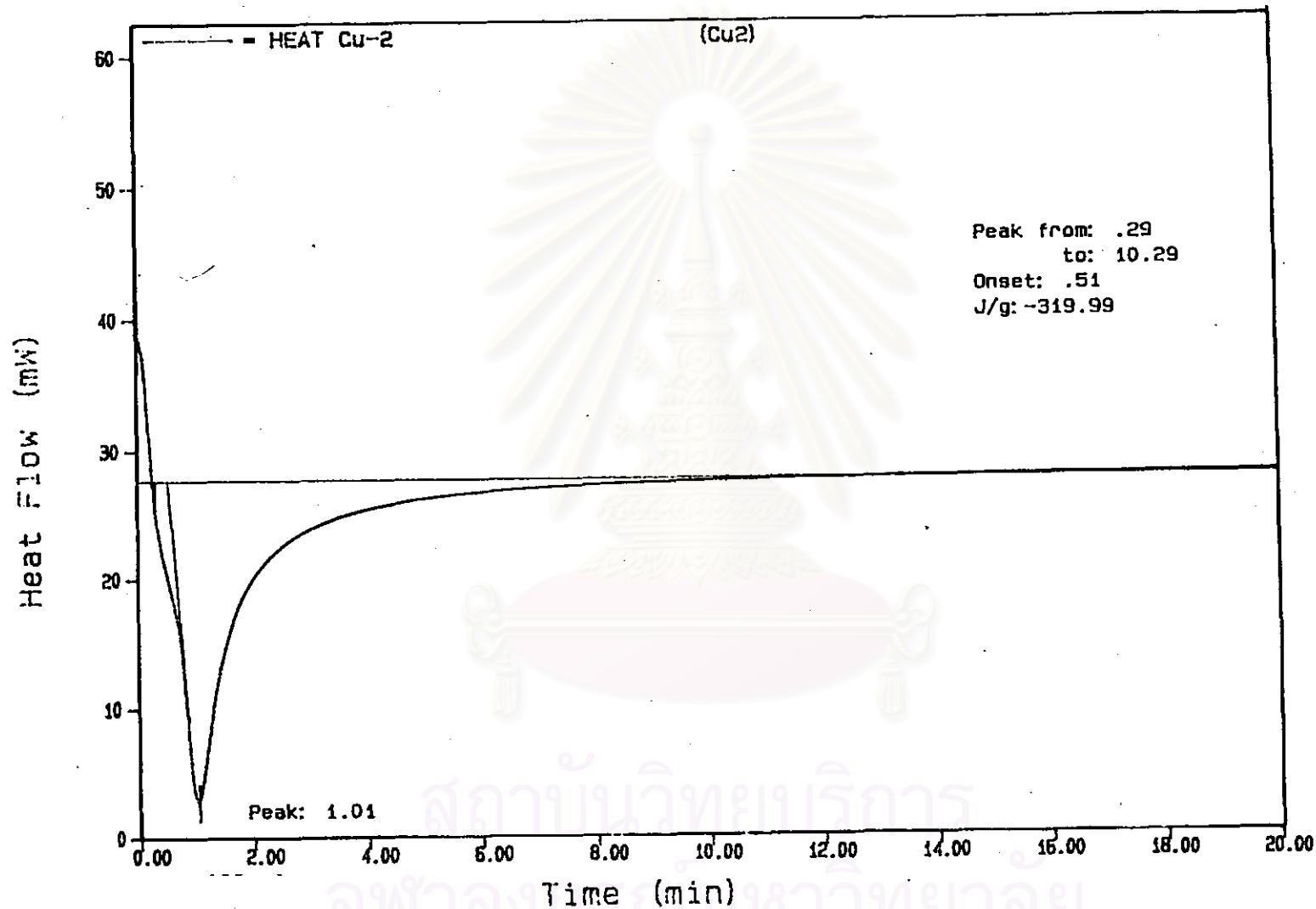


Figure A14 Isothermal DSC thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.2

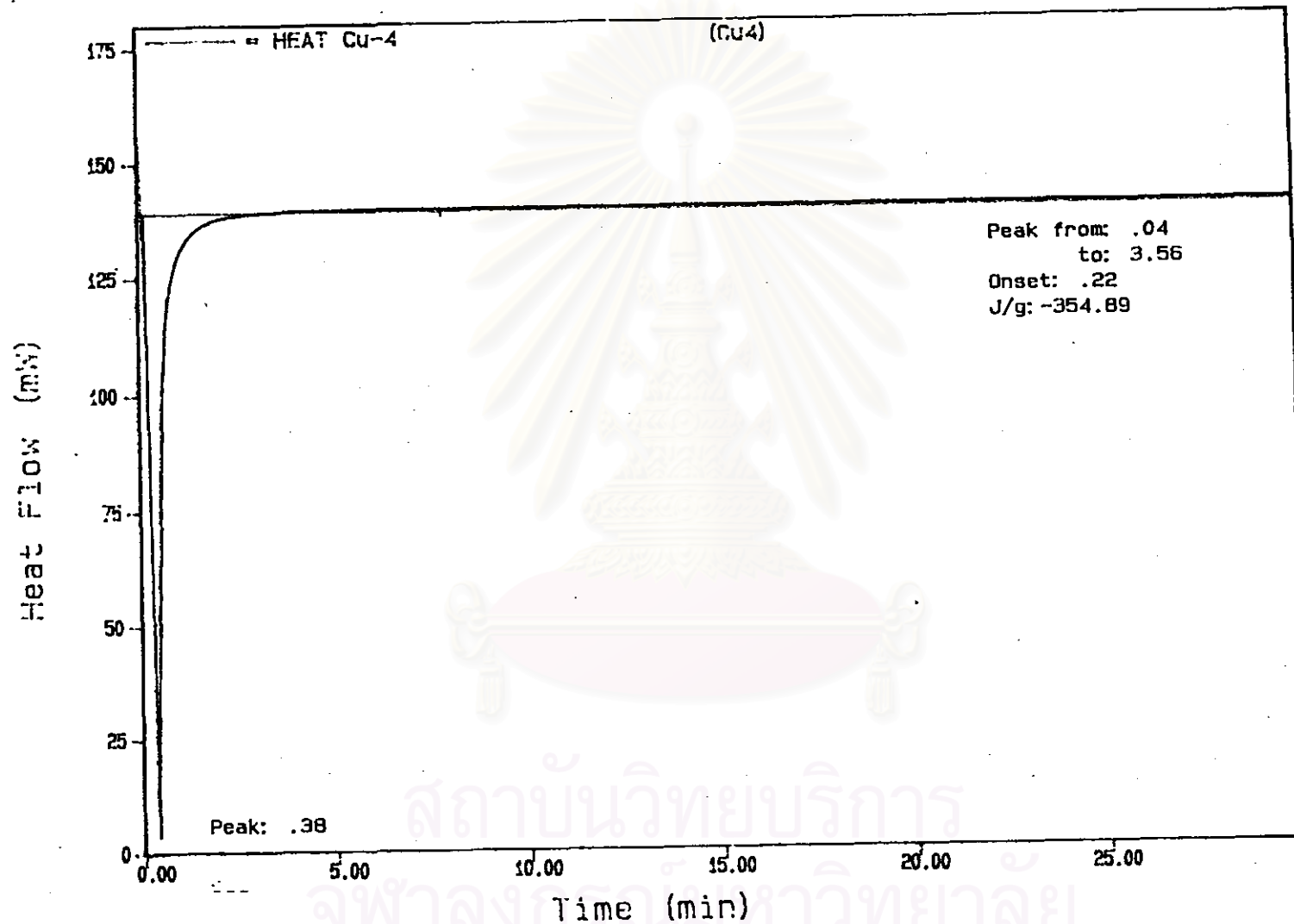


Figure A15 Isothermal DSC thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.4

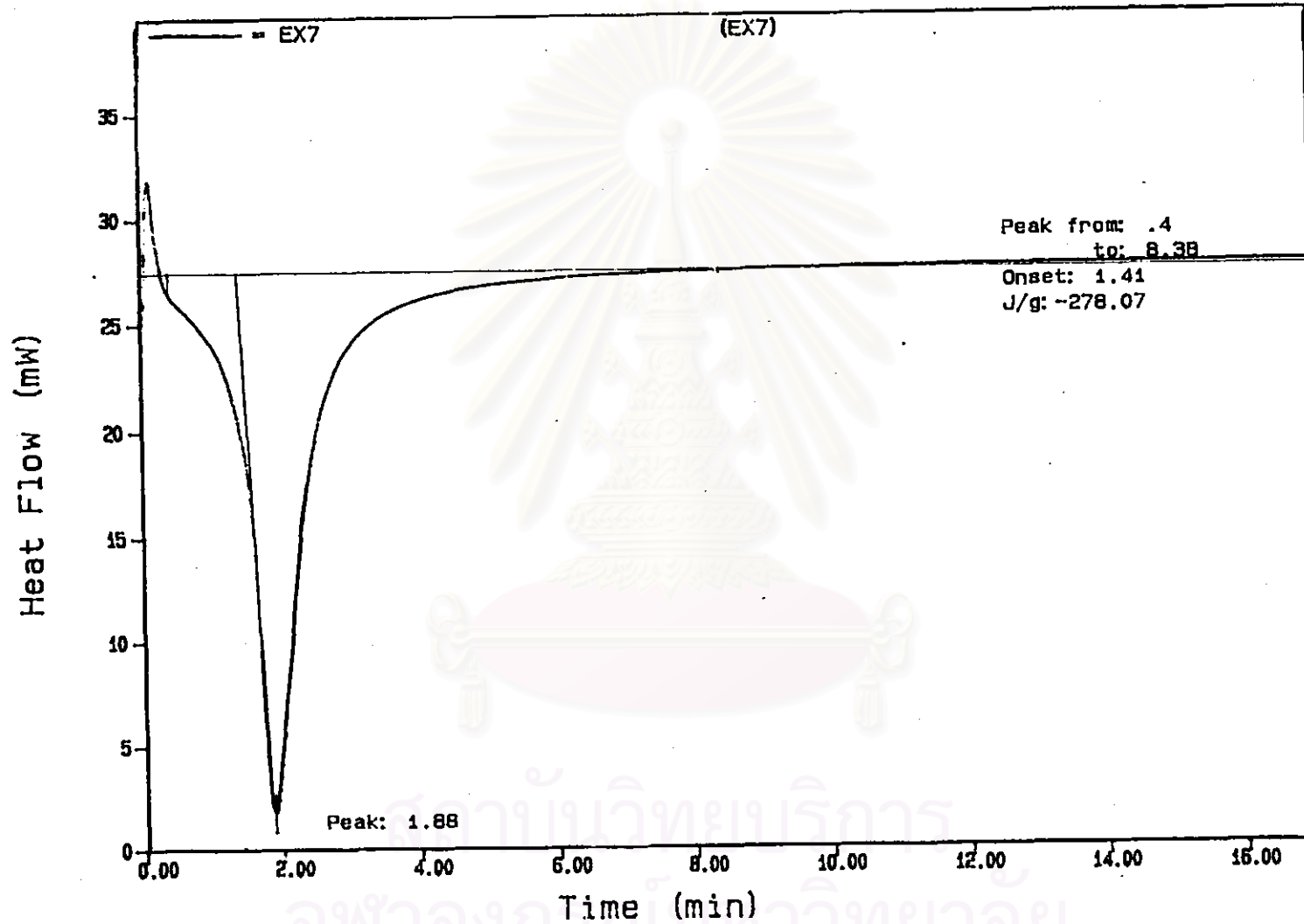


Figure A16 Isothermal DSC thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 4: 0.2

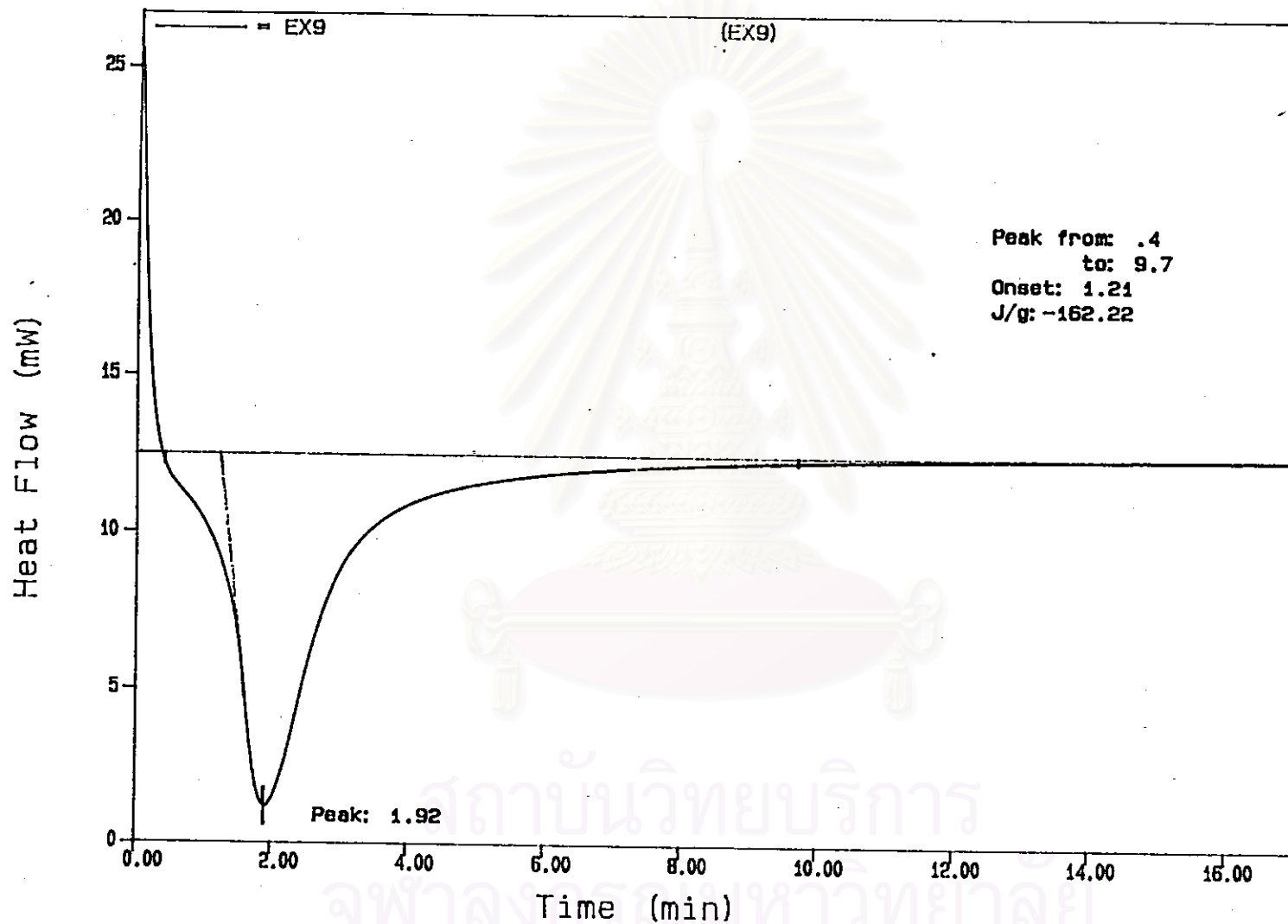


Figure A17 Isothermal DSC thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 8: 0.2

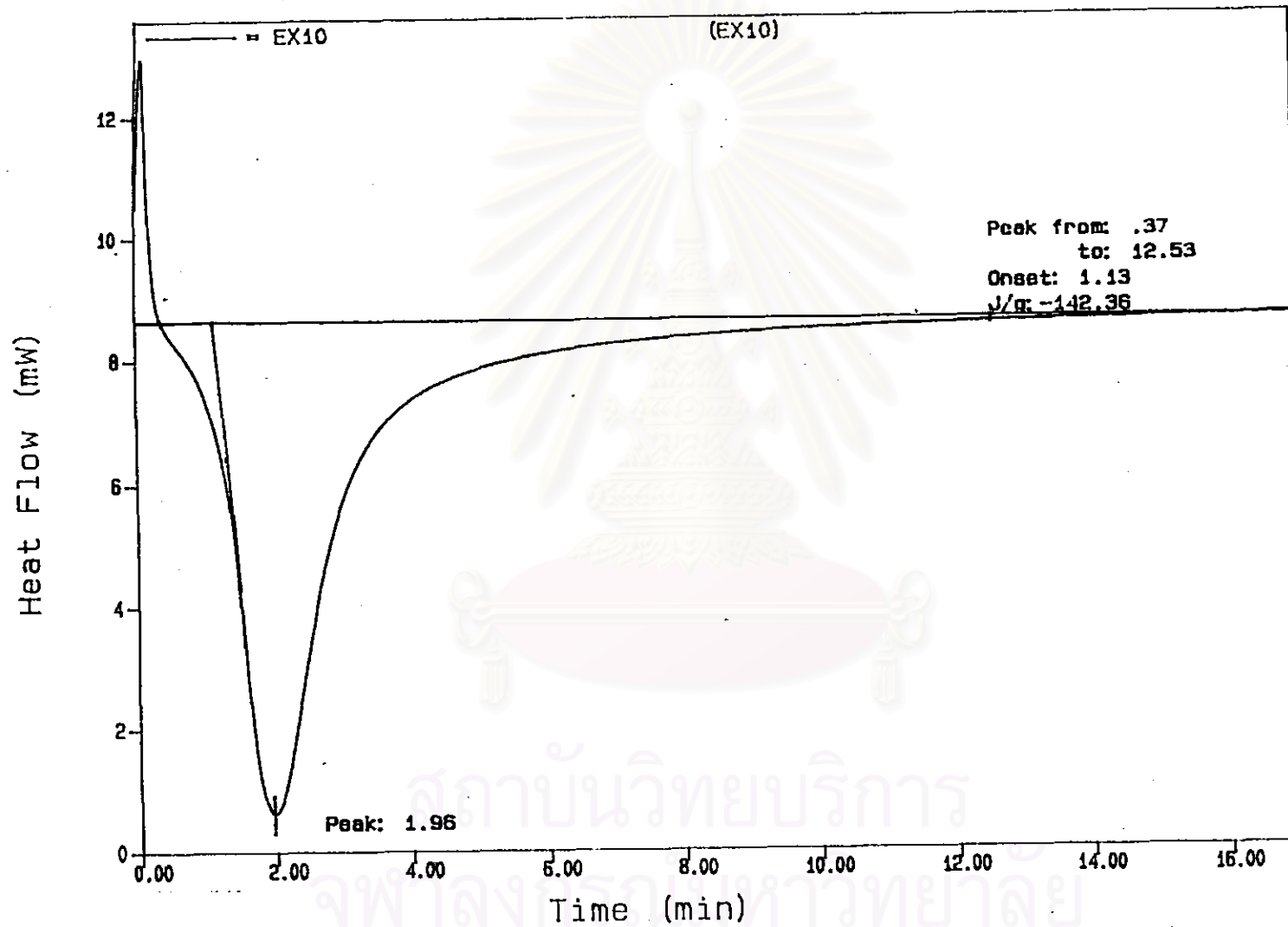


Figure A18 Isothermal DSC thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 10: 0.2

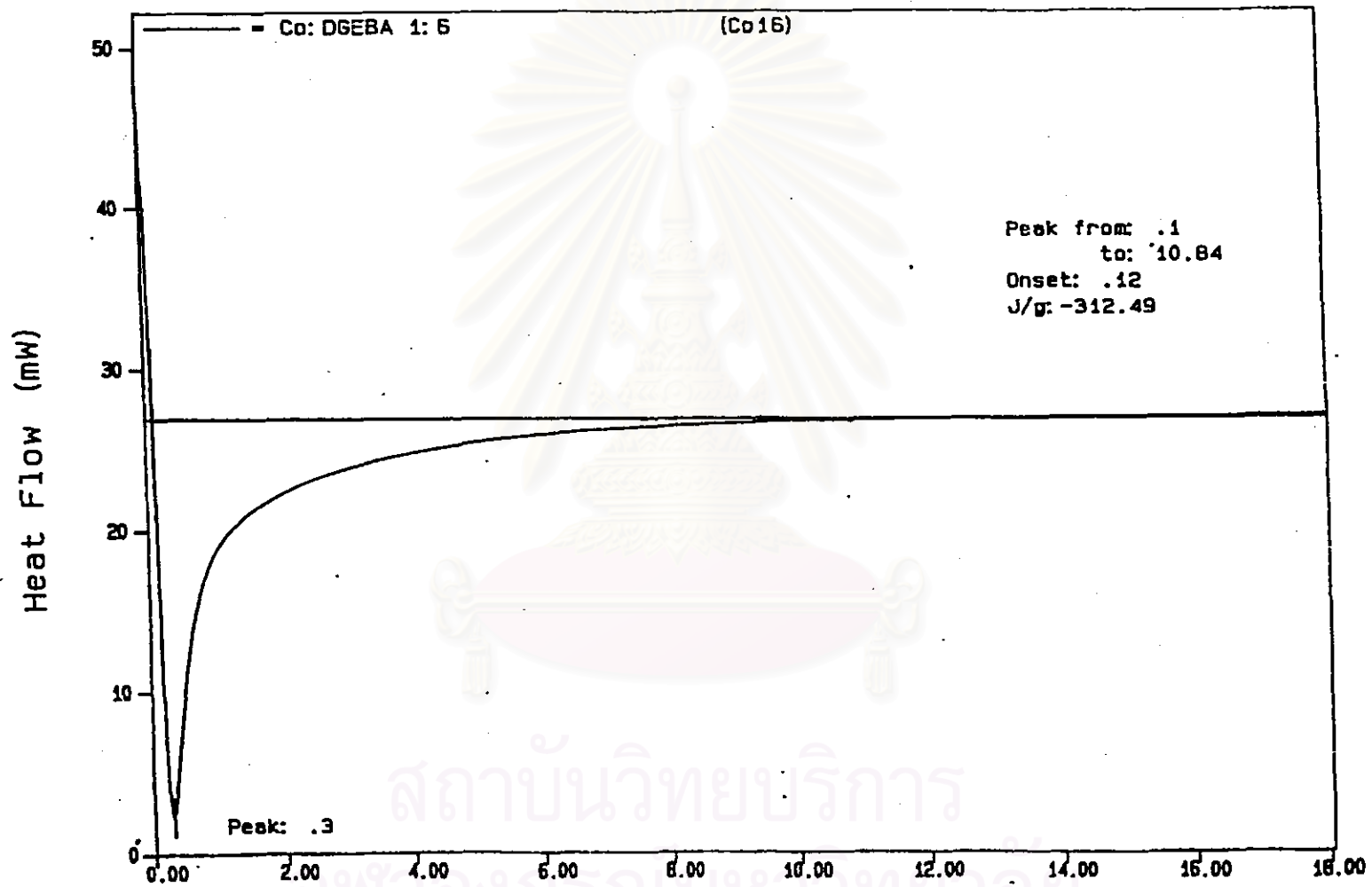


Figure A19 Isothermal DSC thermogram of CoL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0

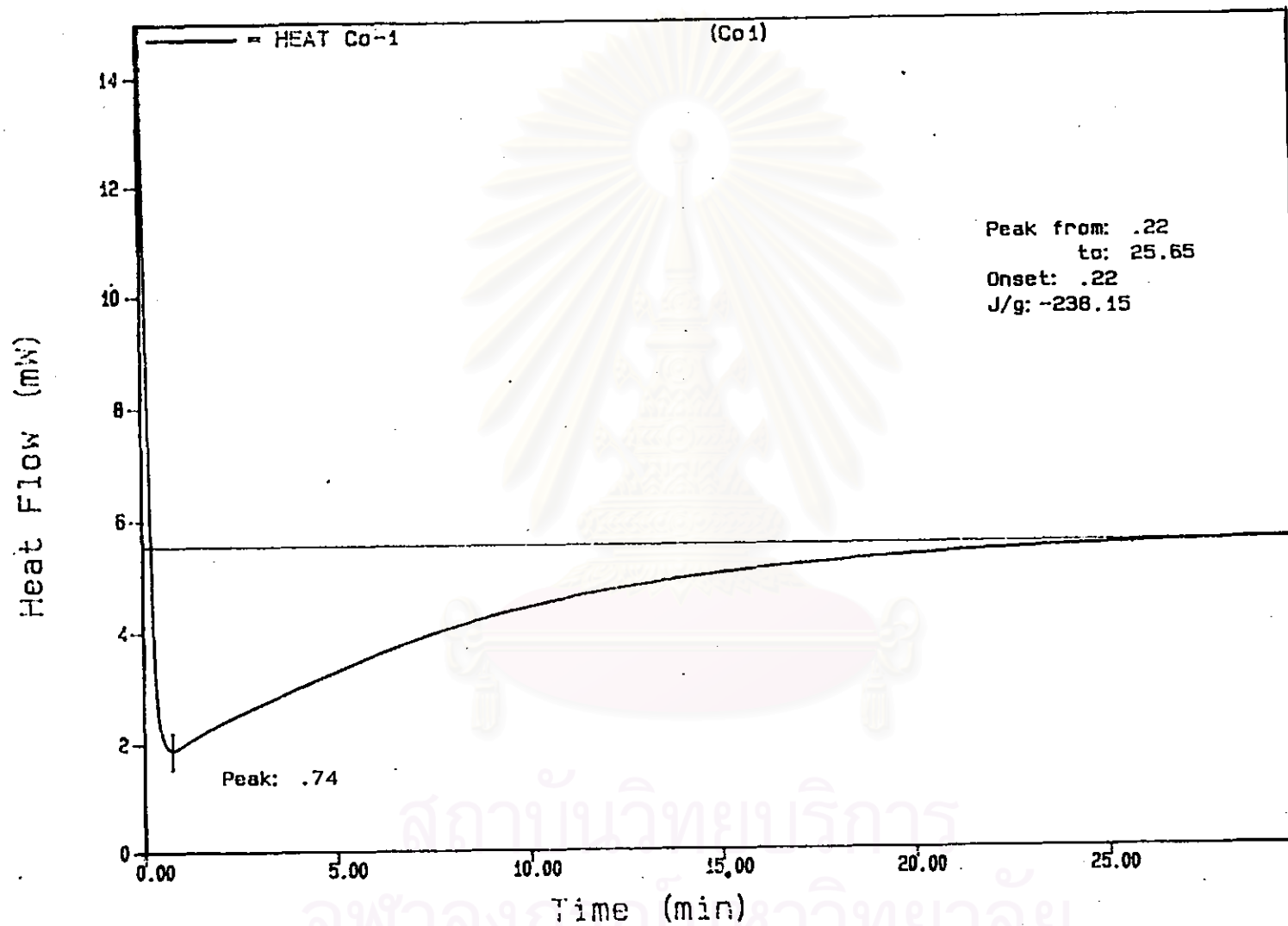


Figure A20 Isothermal DSC thermogram of CoL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.1

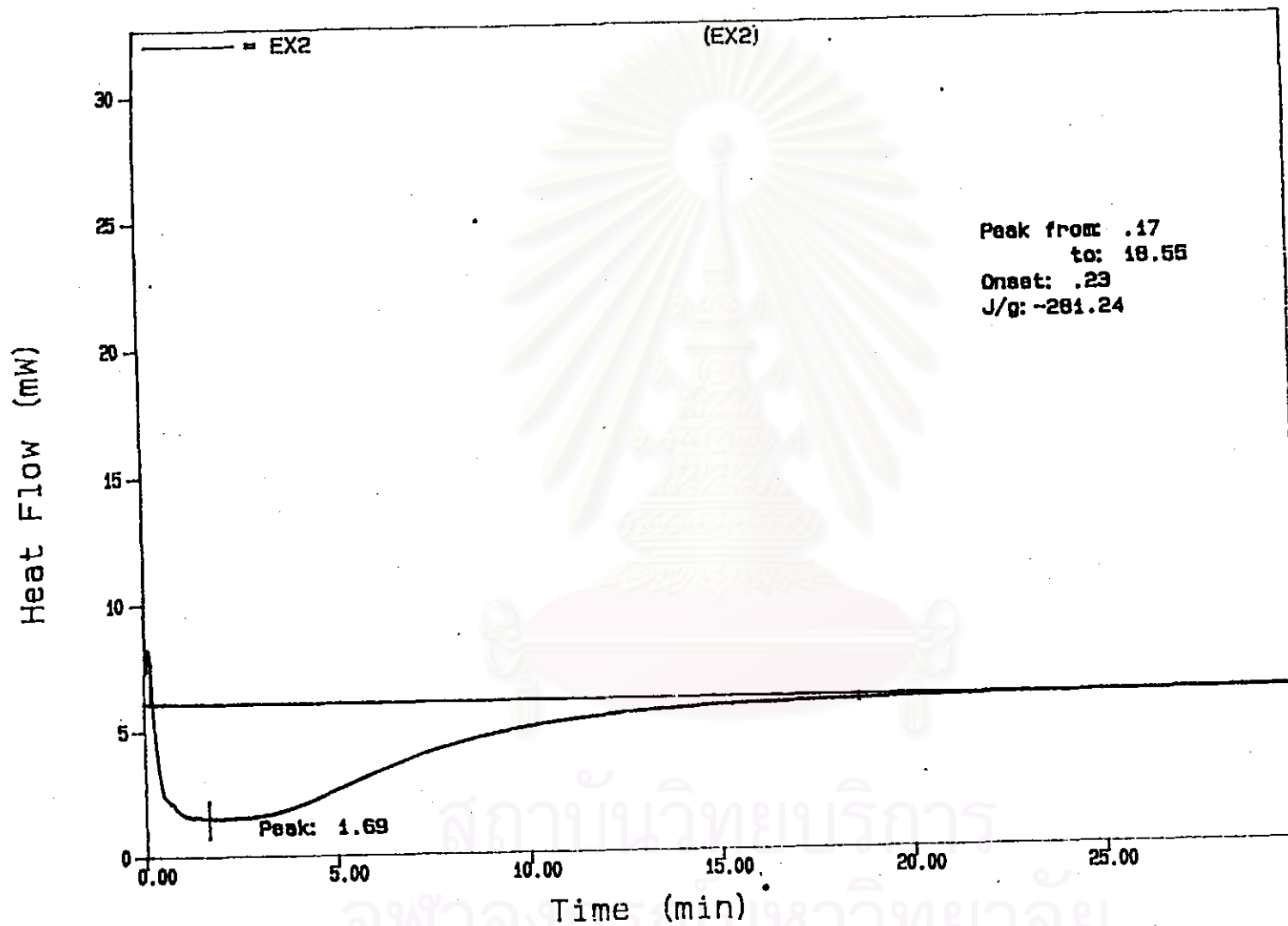


Figure A21 Isothermal DSC thermogram of CoL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.2

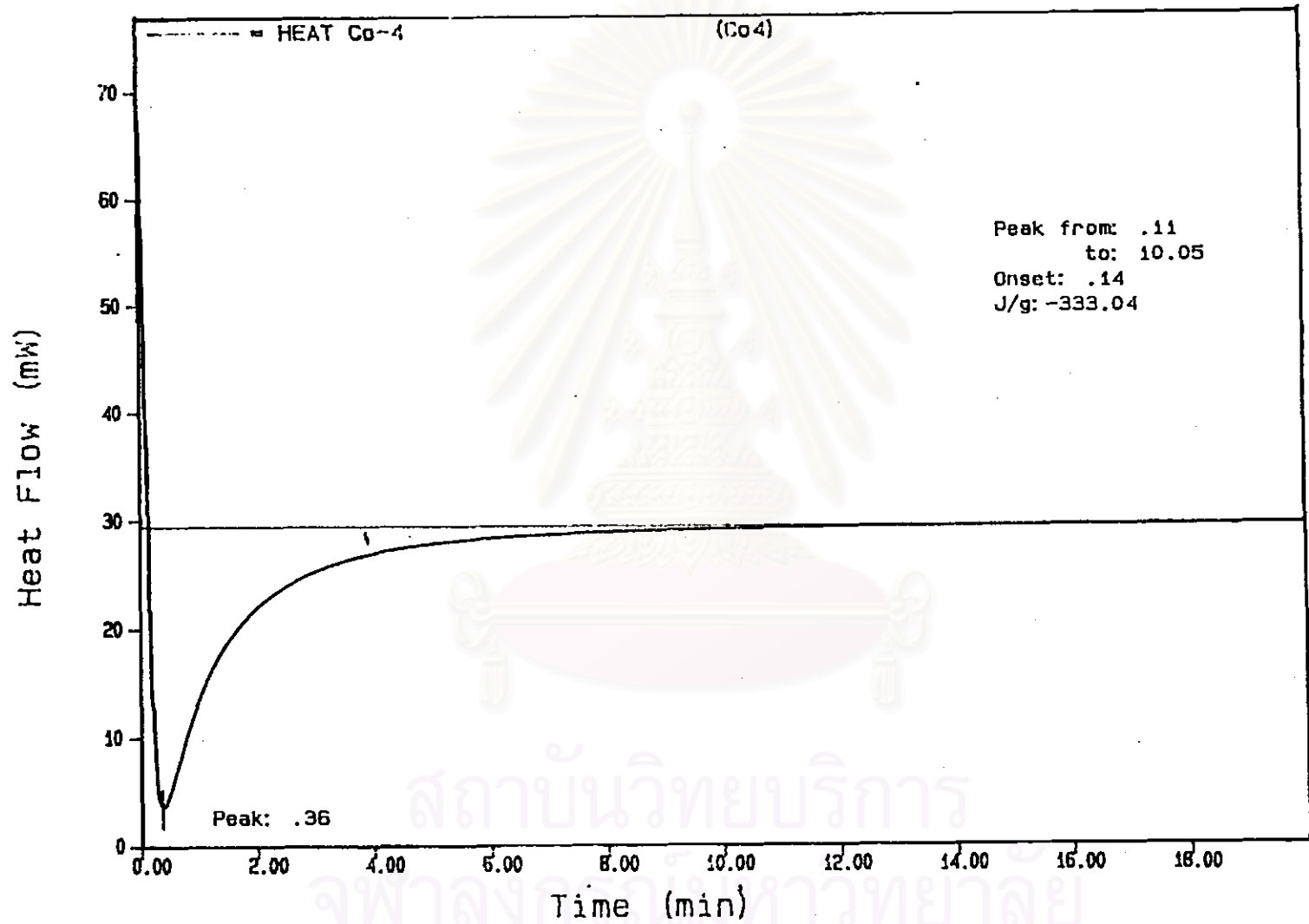


Figure A22 Isothermal DSC thermogram of CoL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.4

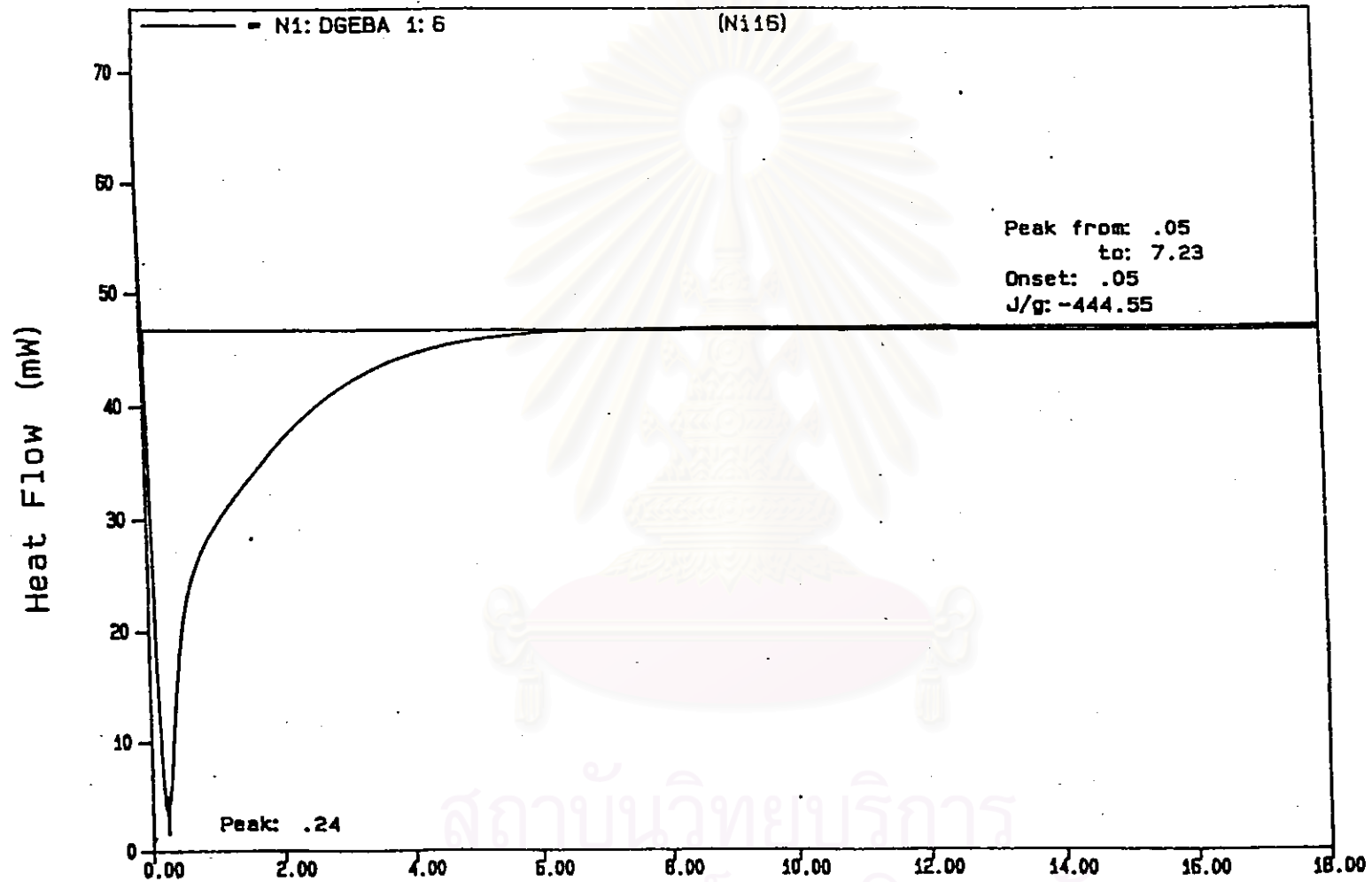


Figure A23 Isothermal DSC thermogram of NiL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0

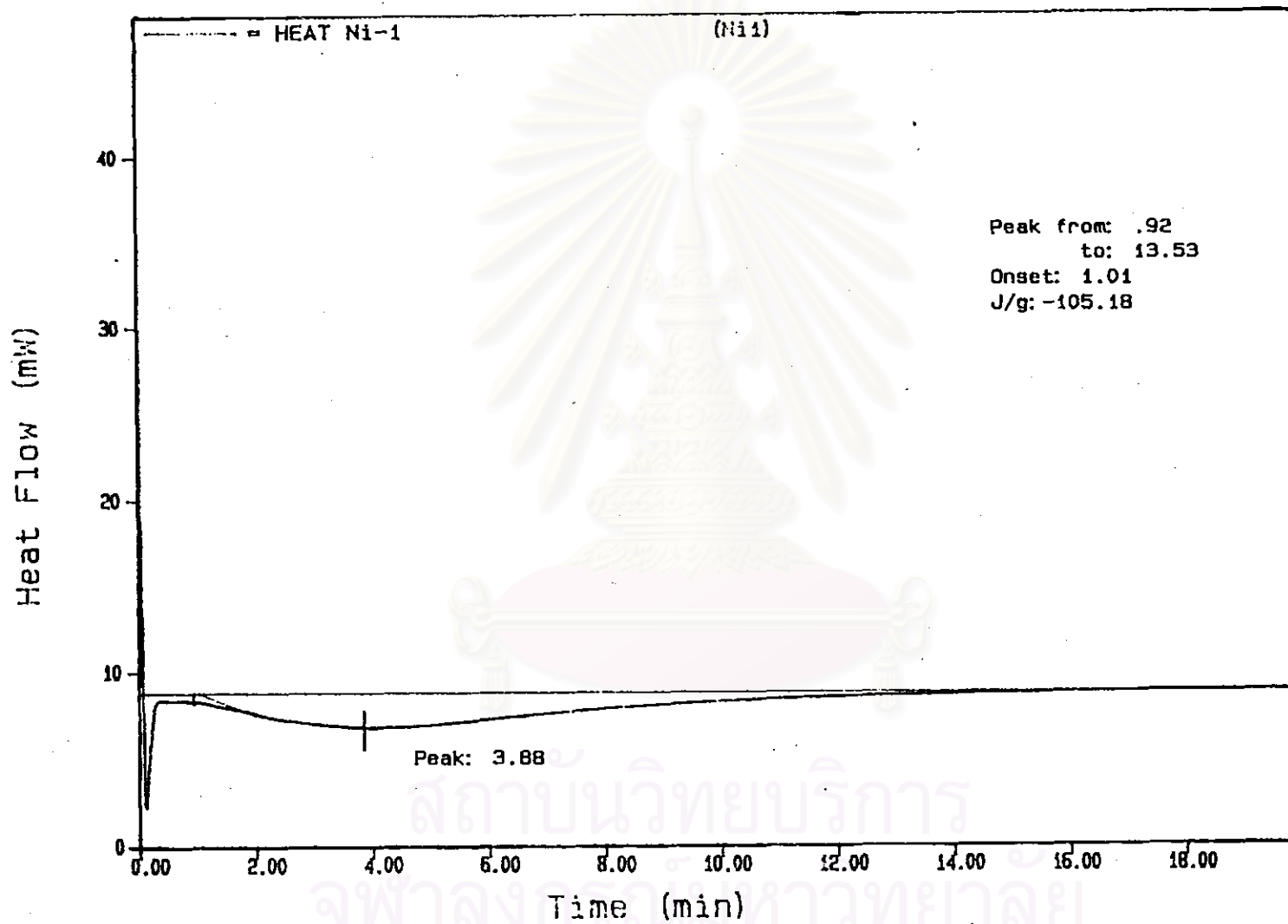


Figure A24 Isothermal DSC thermogram of NiL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.1

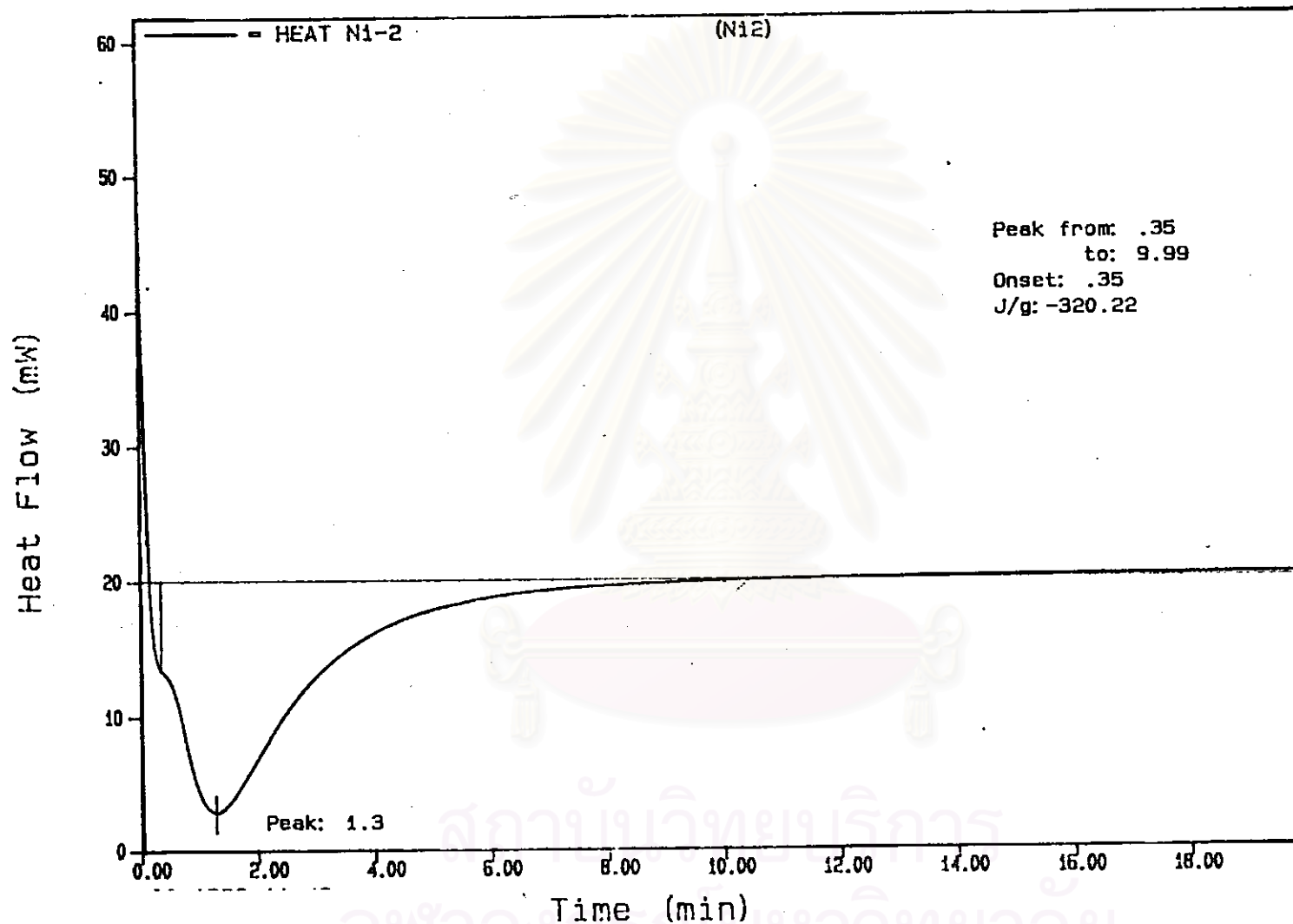


Figure A25 Isothermal DSC thermogram of NiL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.2

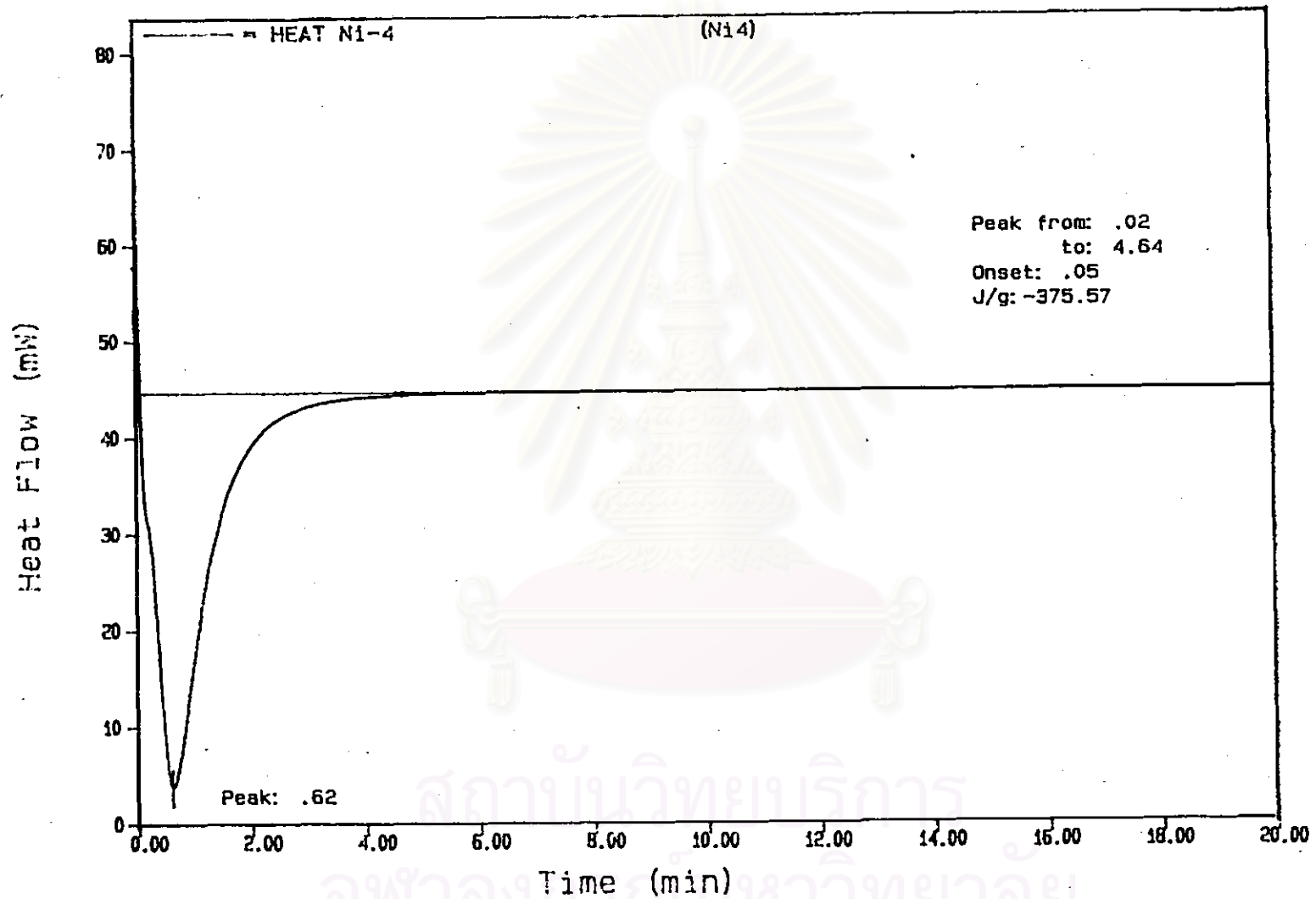


Figure A26 Isothermal DSC thermogram of NiL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.4

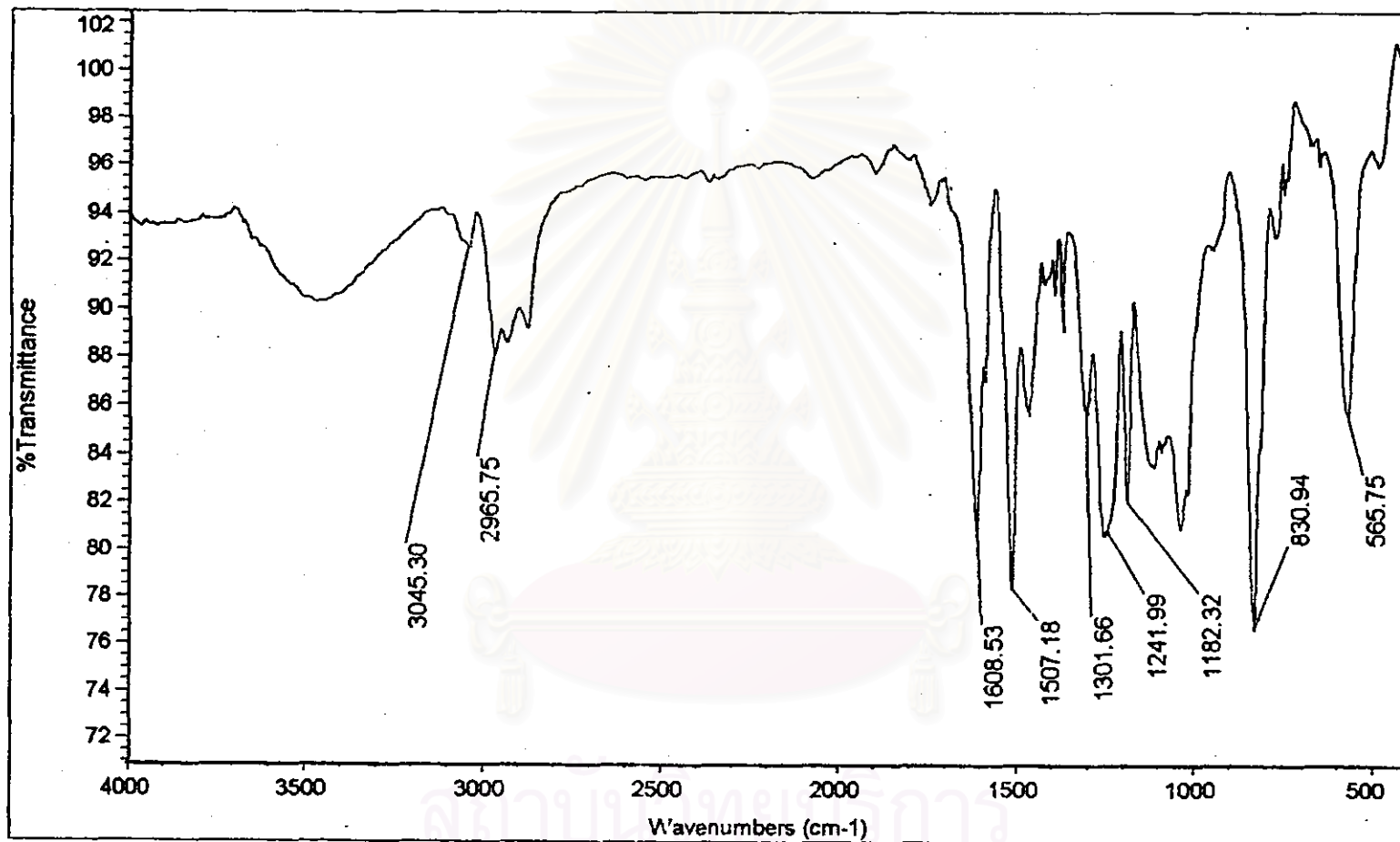


Figure A27 IR spectrum of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 12: 0.2

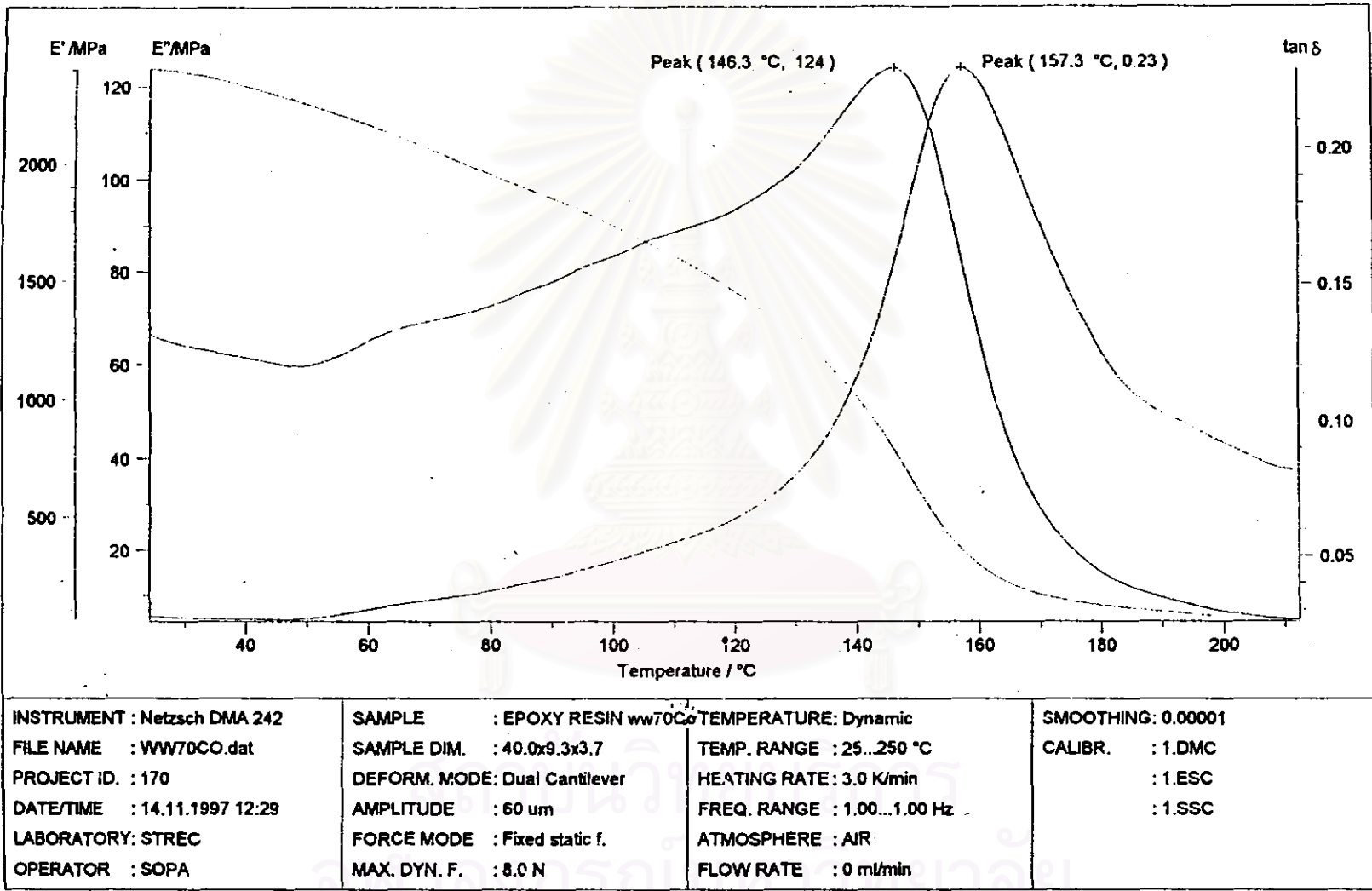


Figure A28 DMA thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 4: 0.2

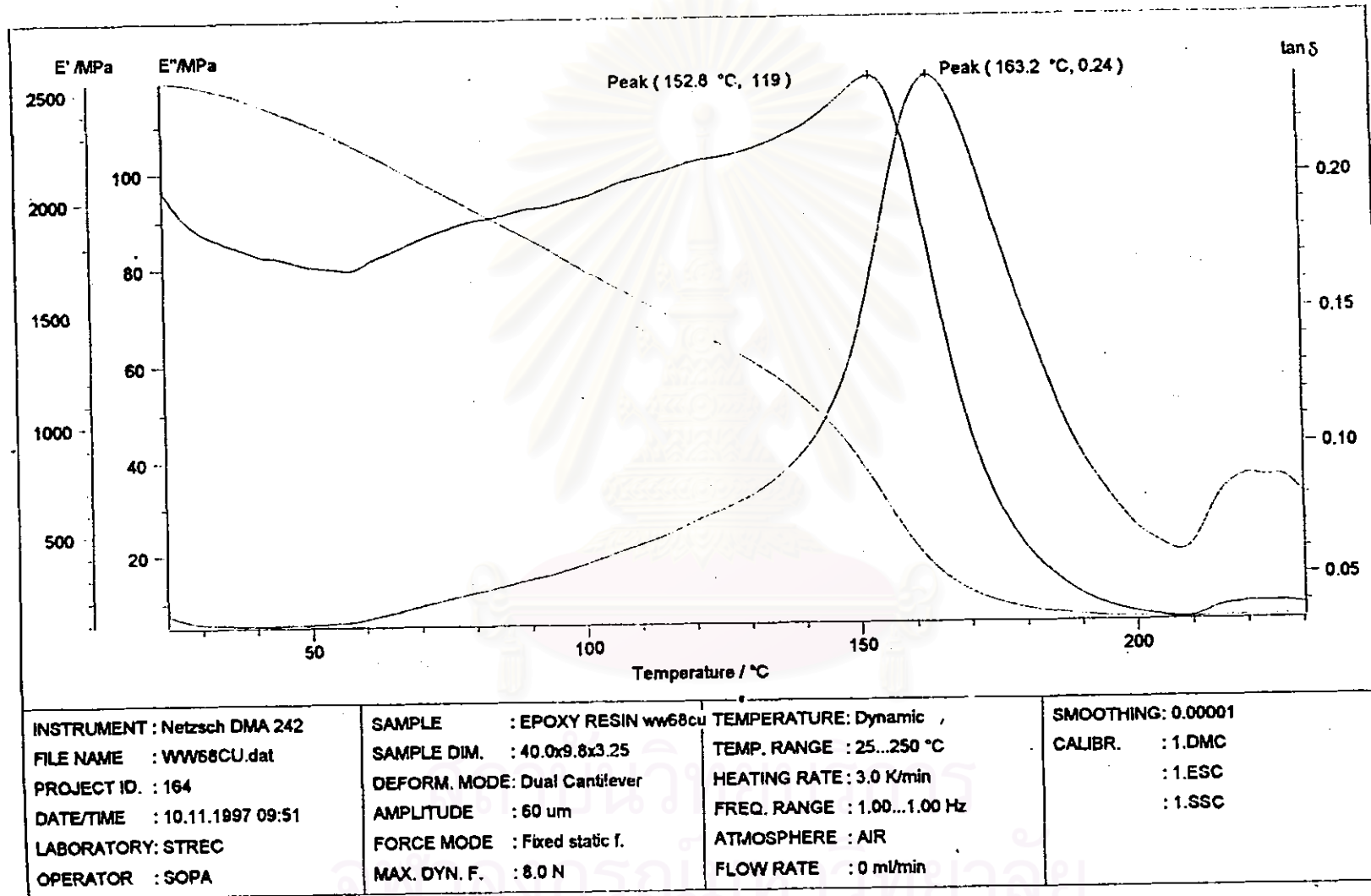


Figure A29 DMA thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.2

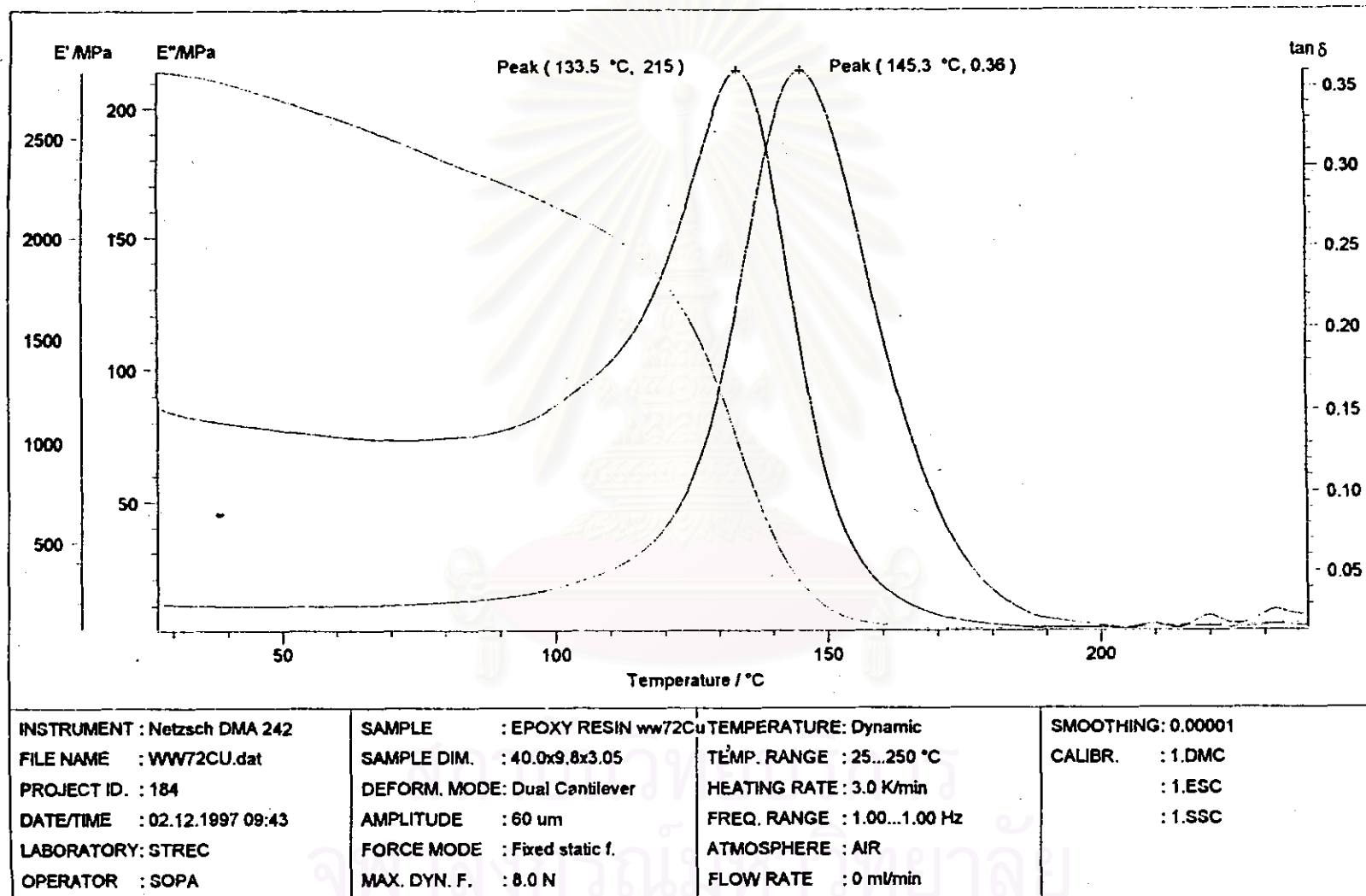


Figure A30 DMA thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 8: 0.2

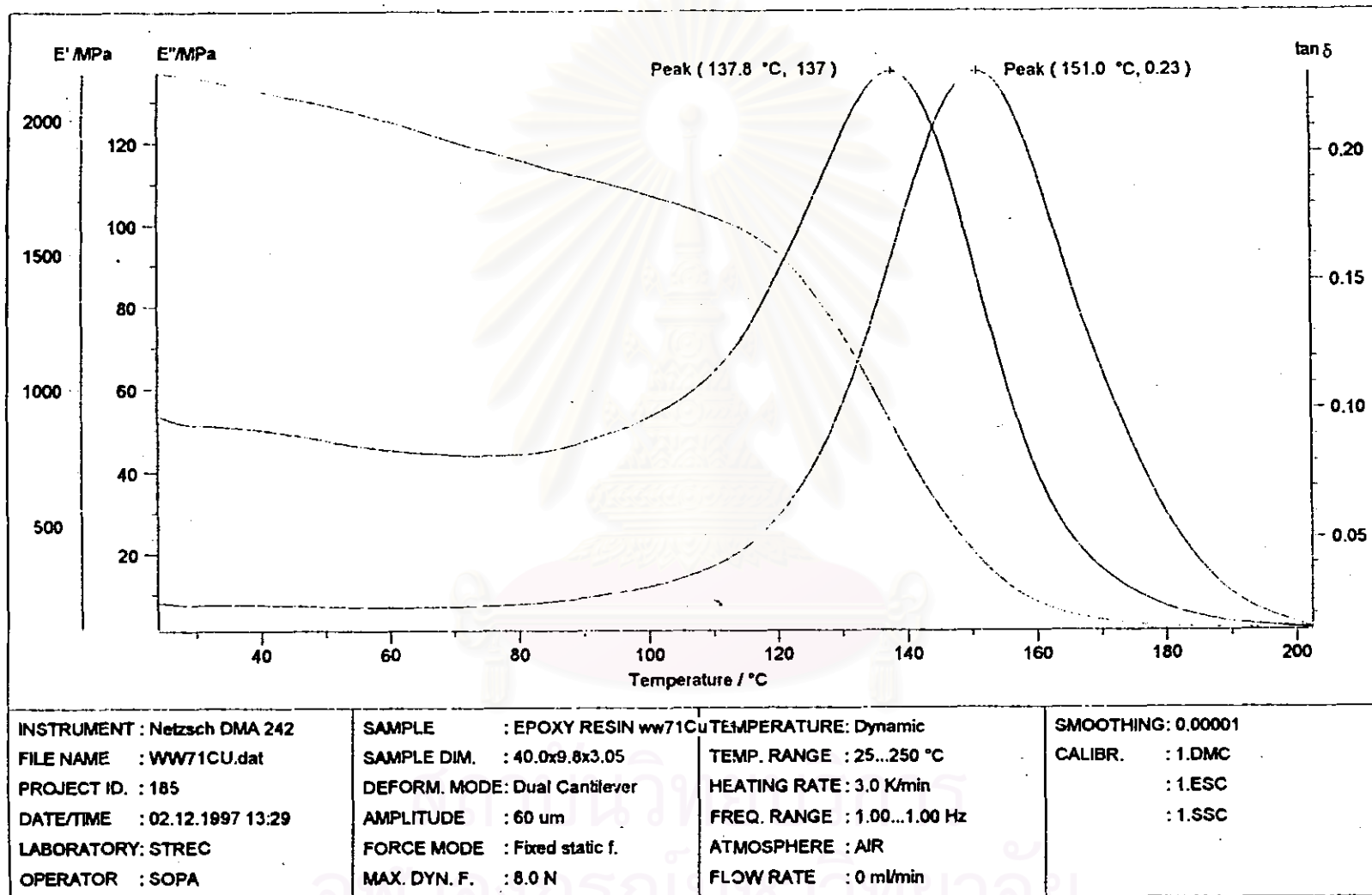


Figure A31 DMA thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 10: 0.2

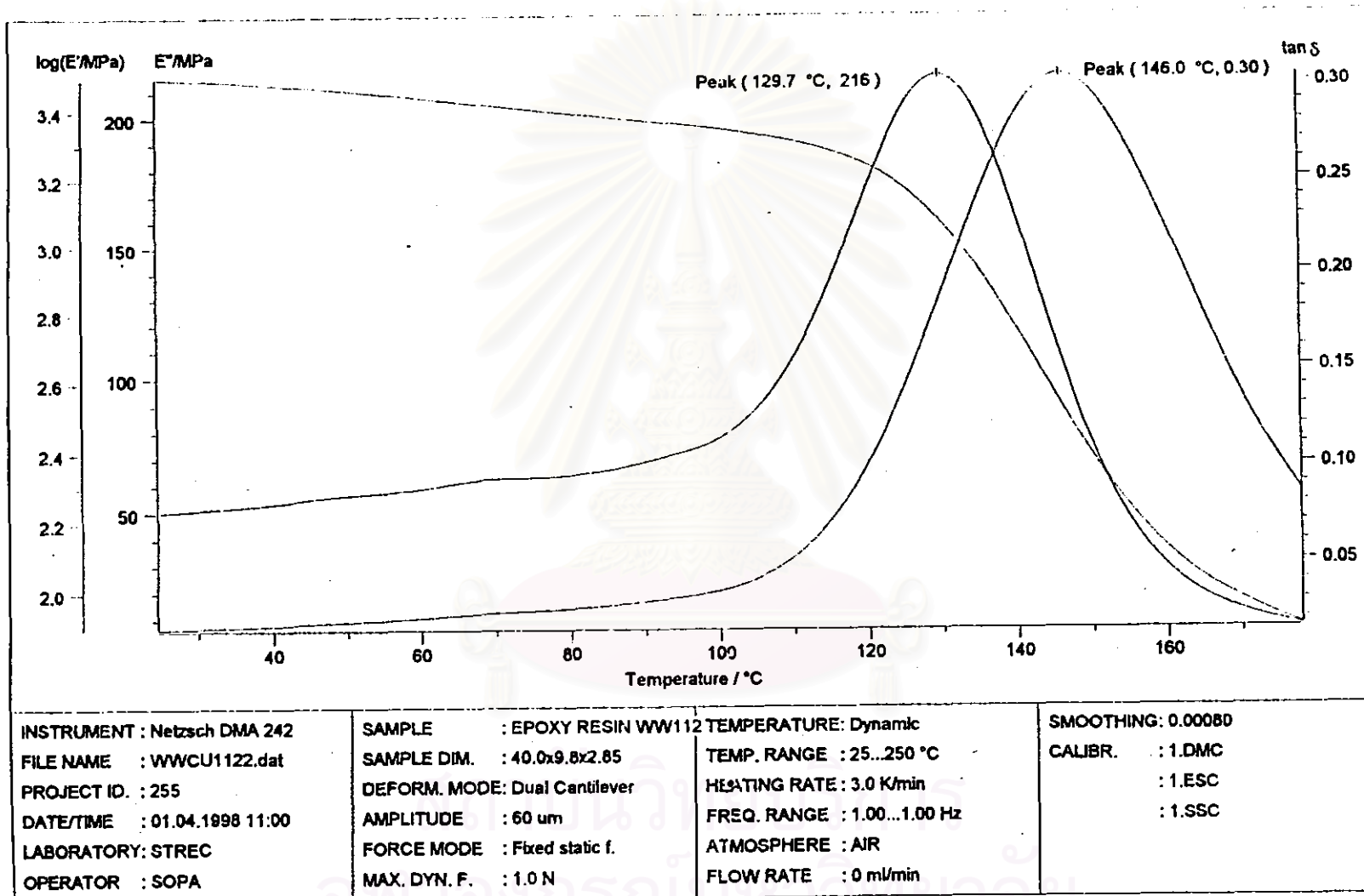


Figure A32 DMA thermogram of CuL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 12: 0.2

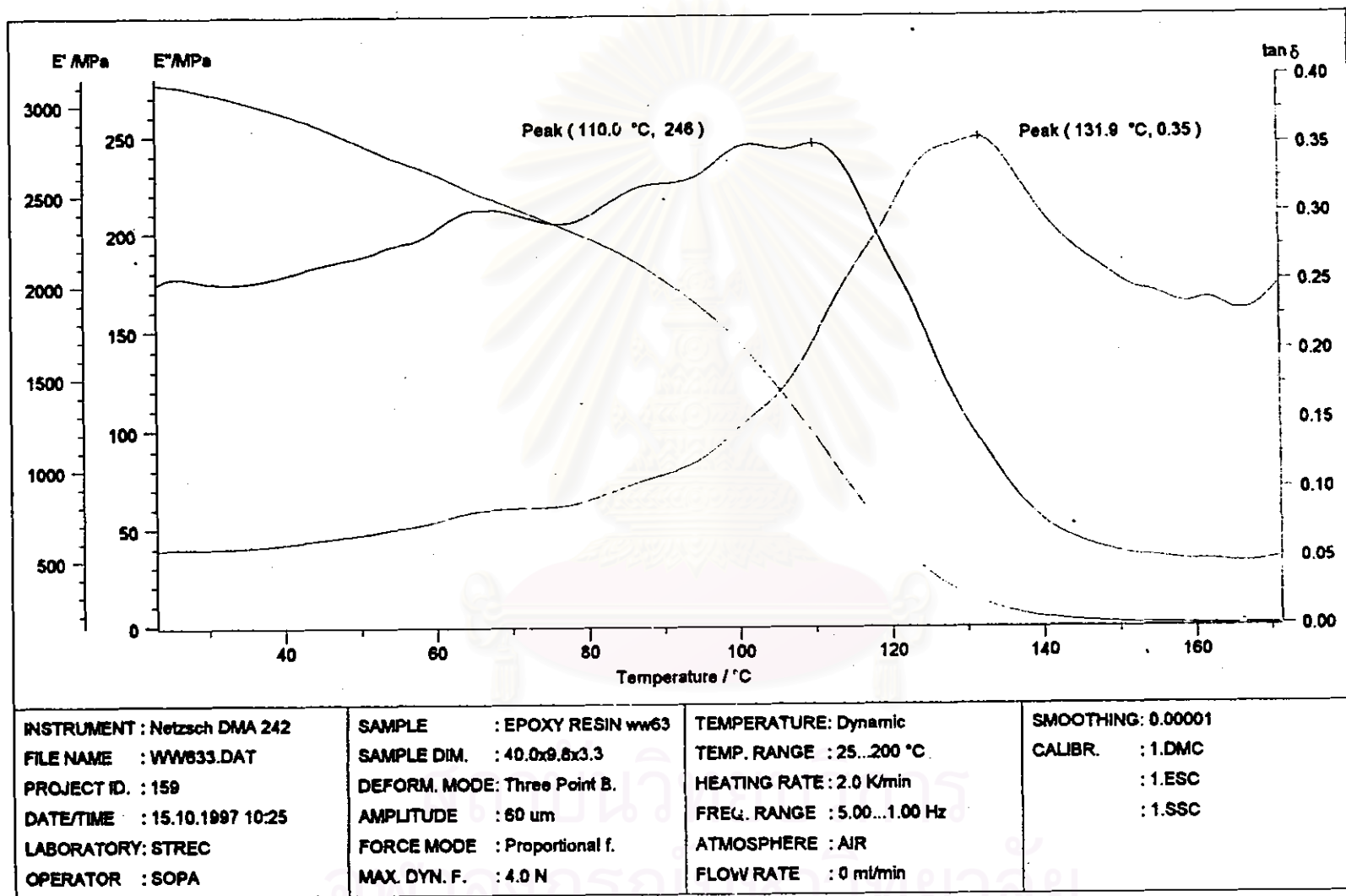


Figure A33 DMA thermogram of CoL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 4: 0.2

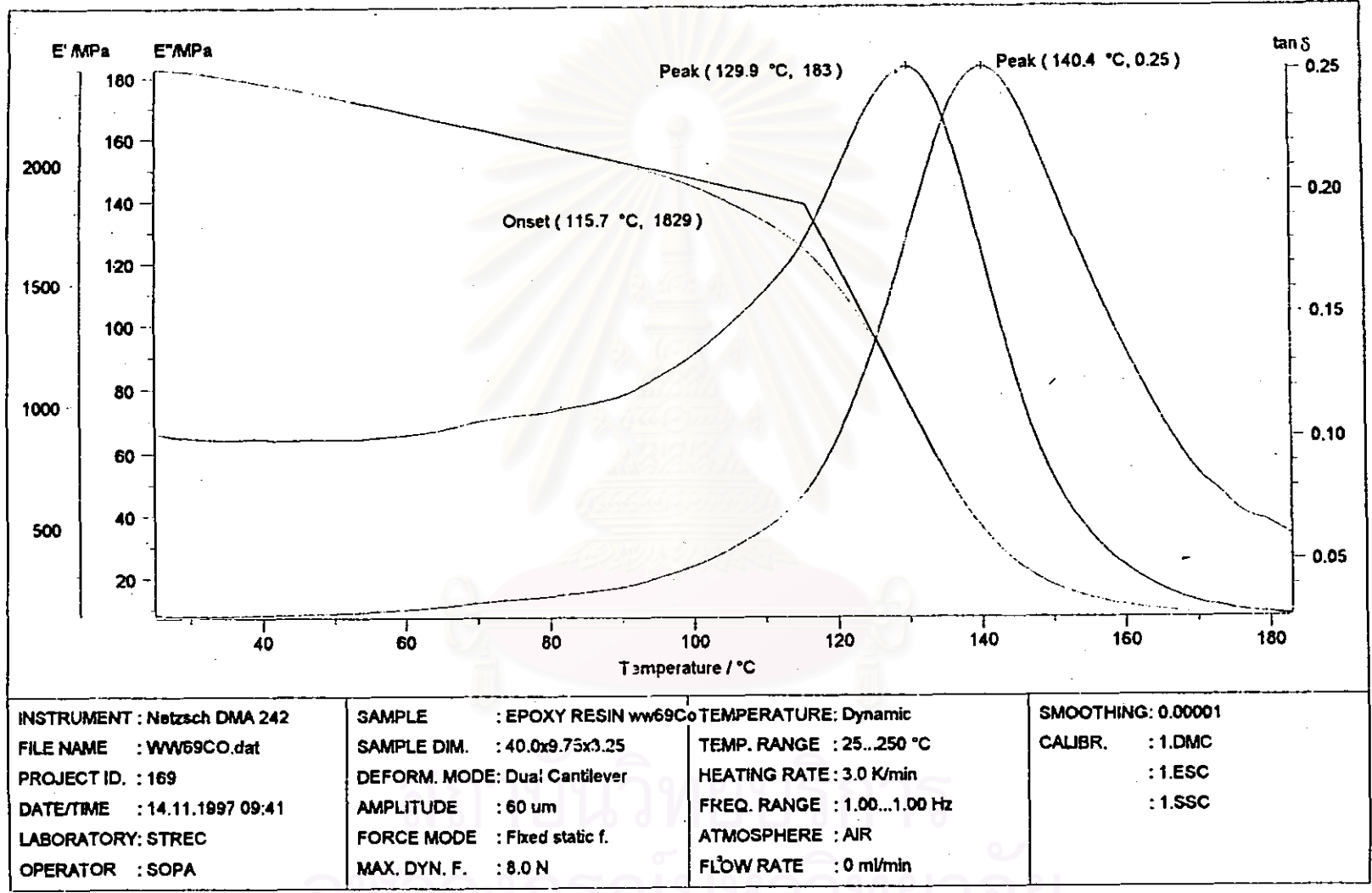


Figure A34 DMA thermogram of CoL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.2

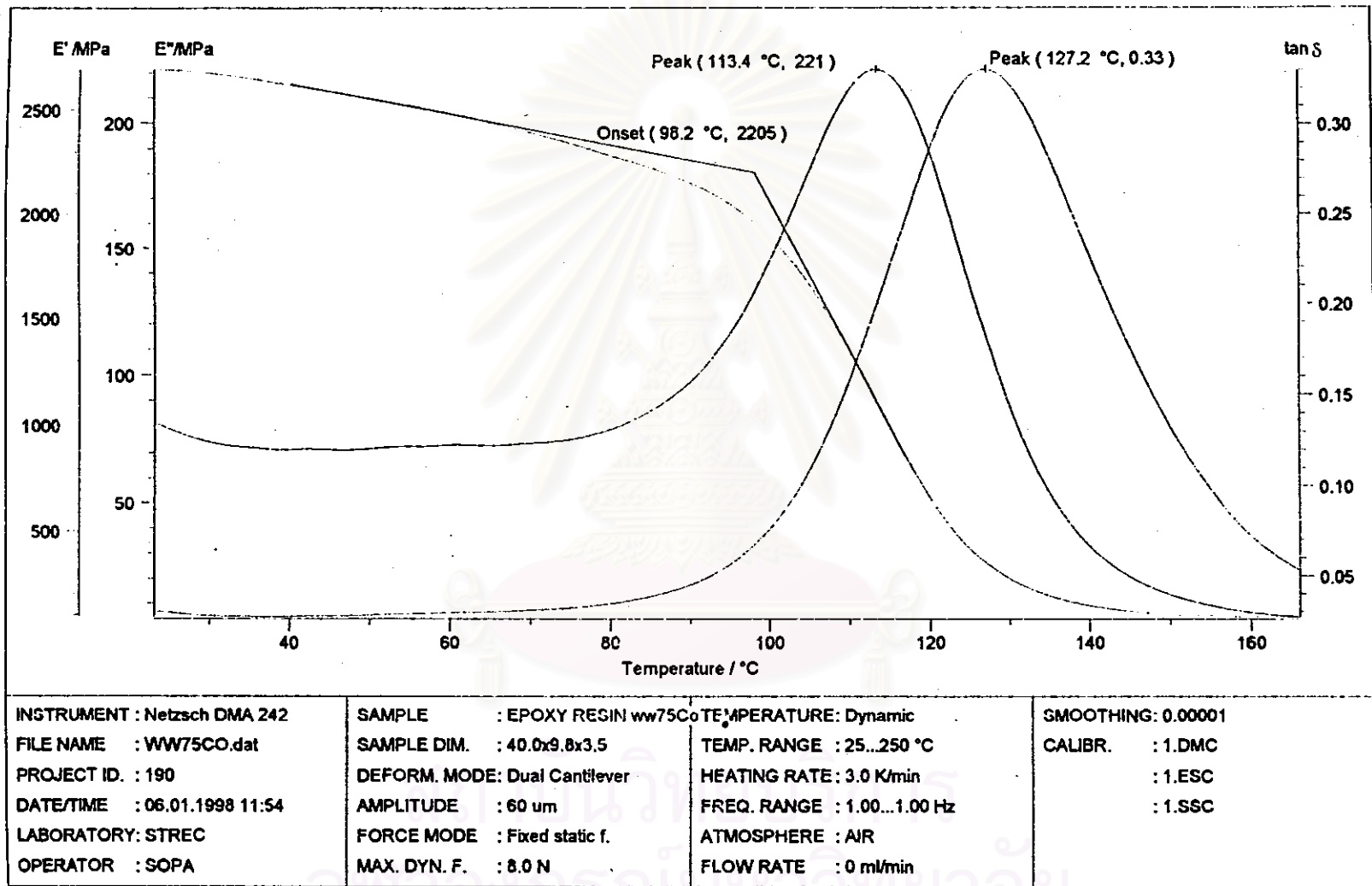


Figure A35 DMA thermogram of CoL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 8: 0.2

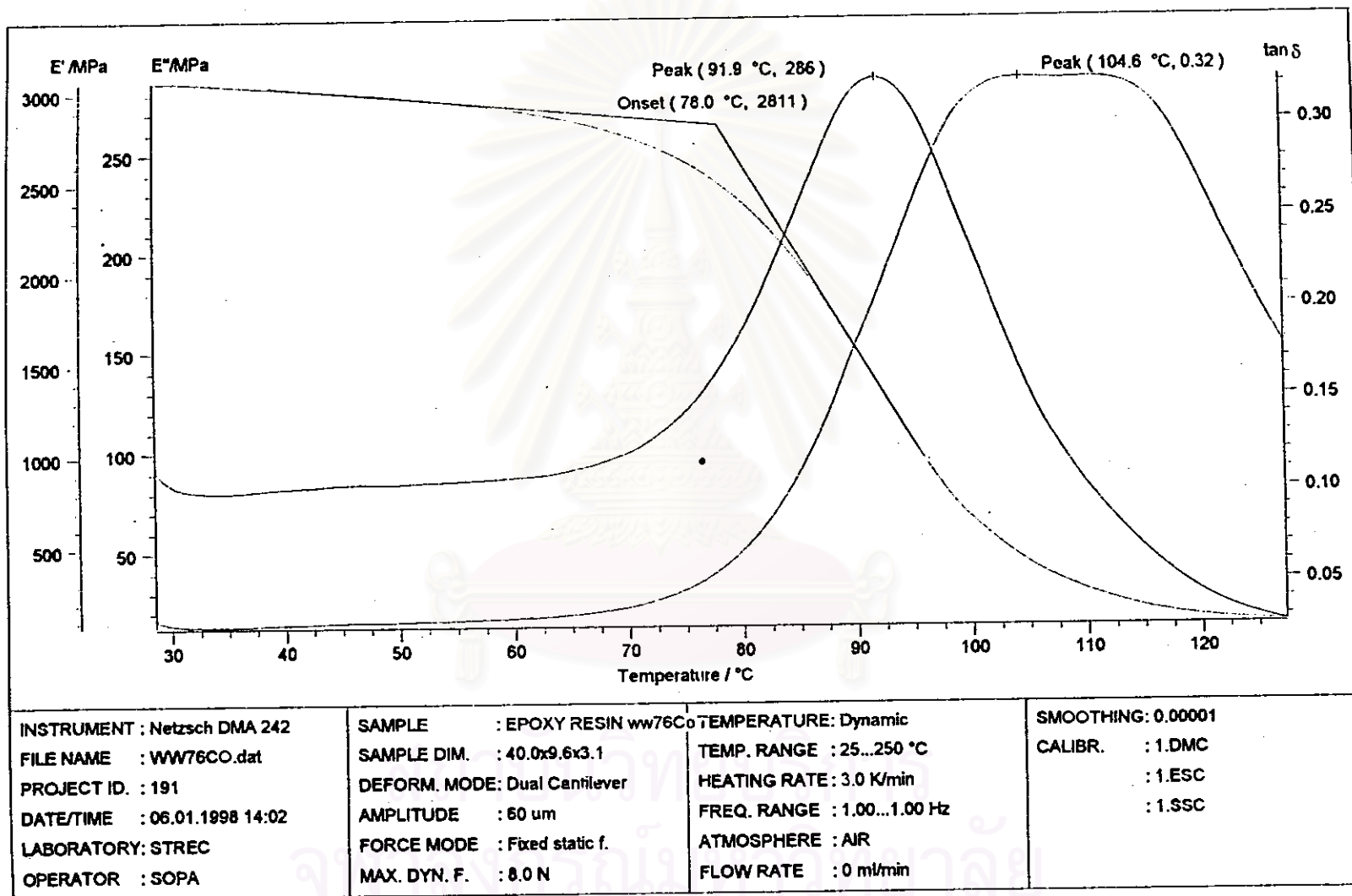


Figure A36 DMA thermogram of CoL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 10: 0.2

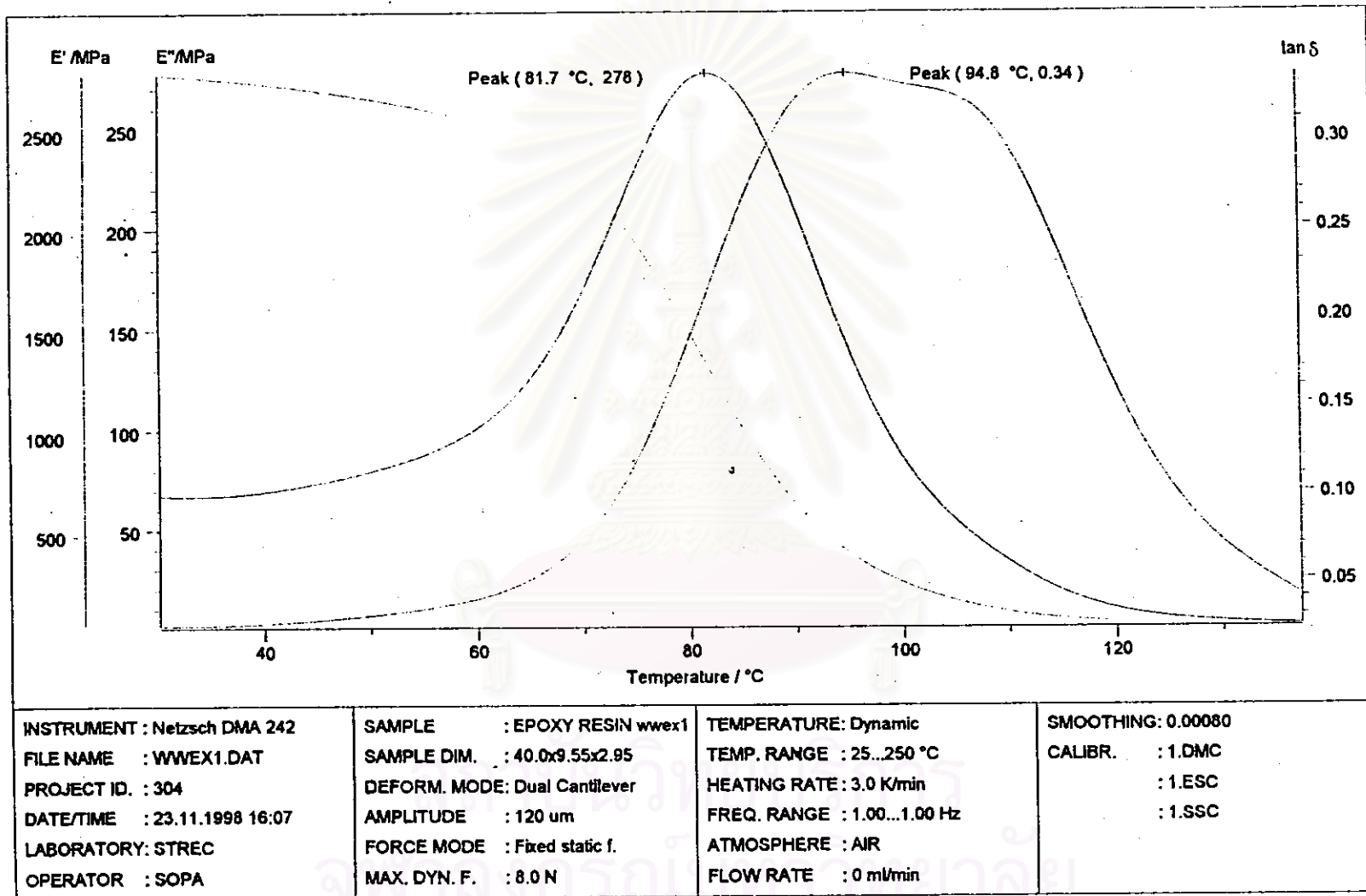


Figure A37 DMA thermogram of CoL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 12: 0.2

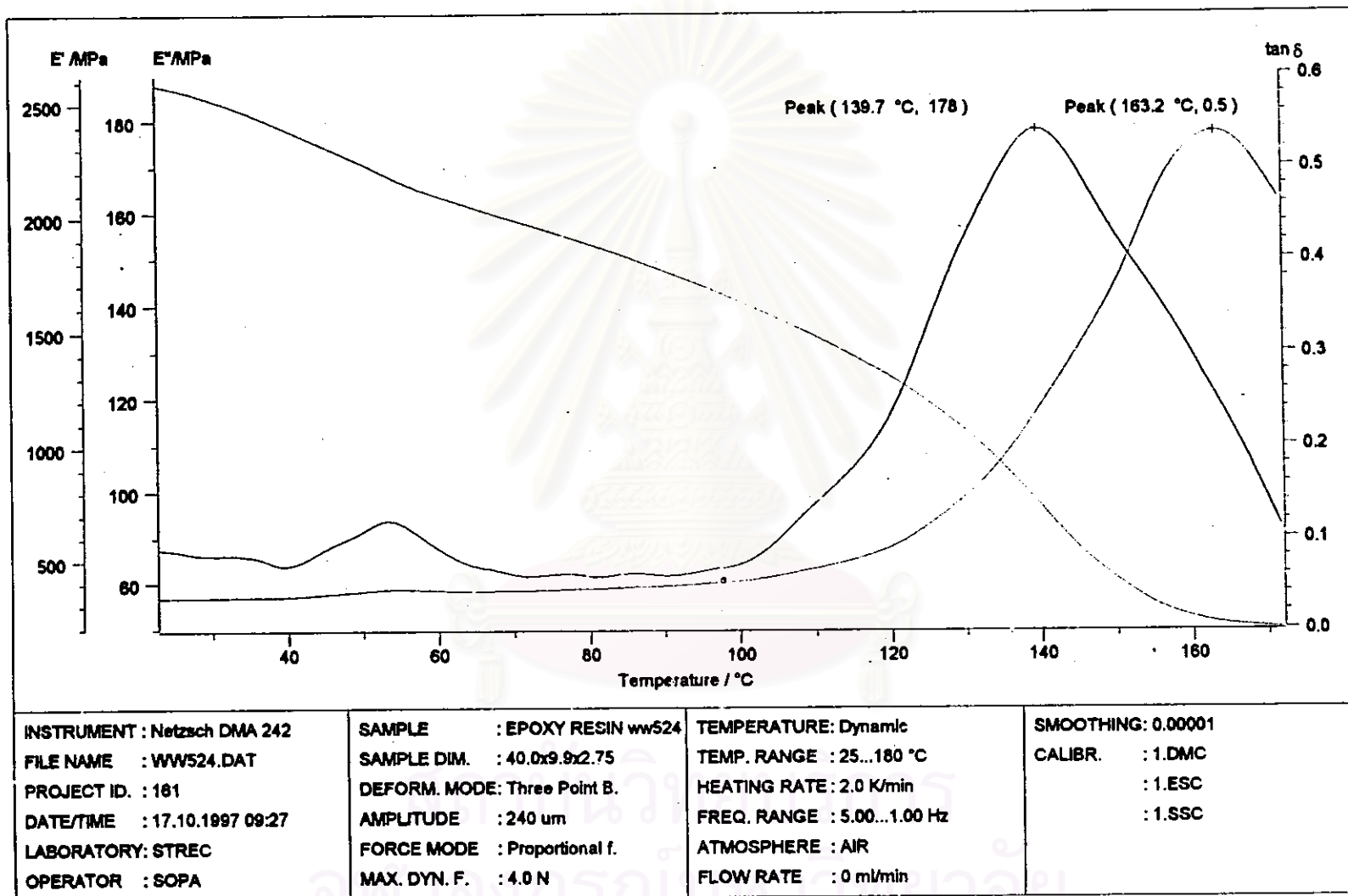


Figure A38 DMA thermogram of NiL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 4: 0.2

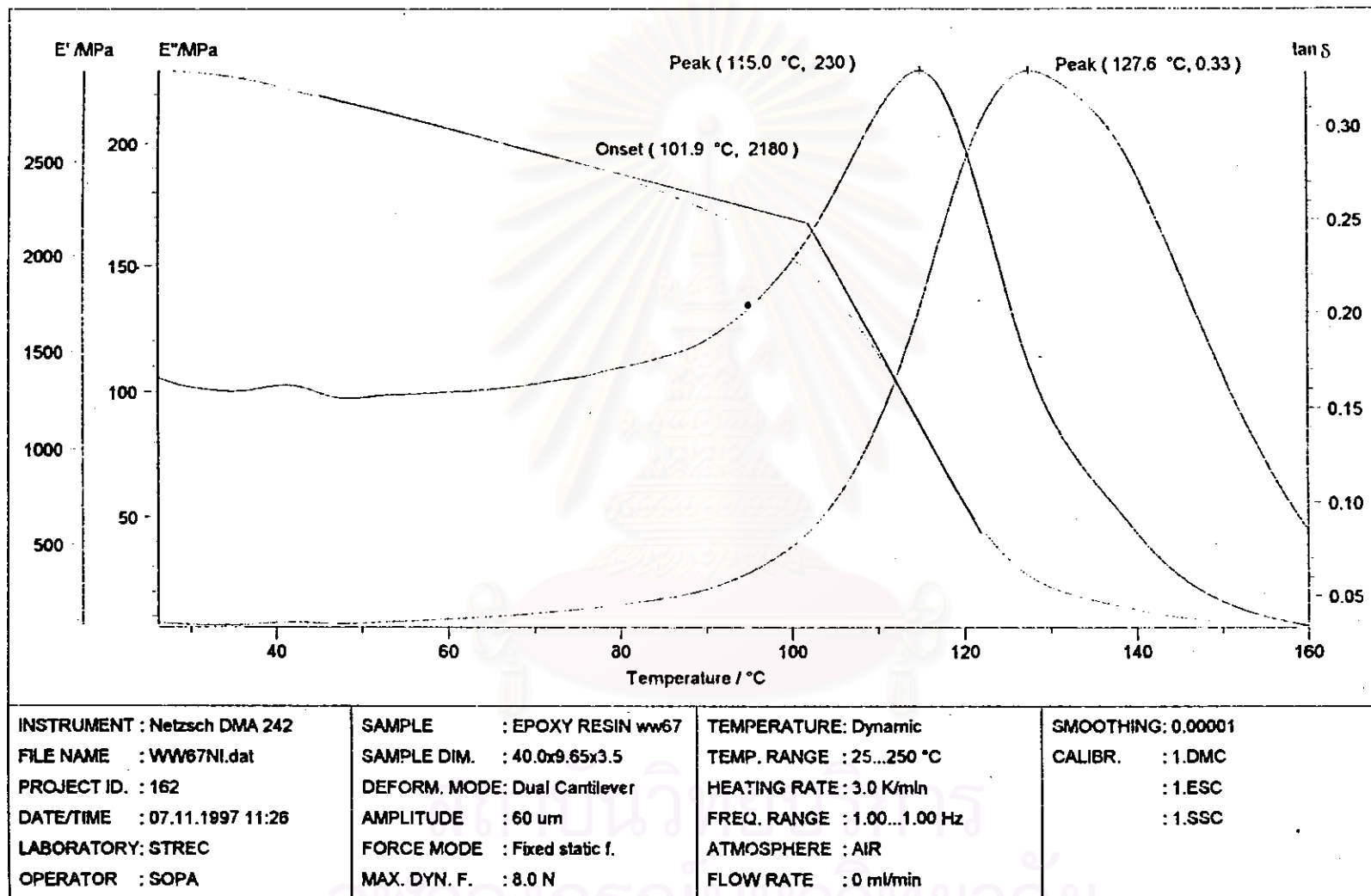


Figure A39 DMA thermogram of NiL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 6: 0.2

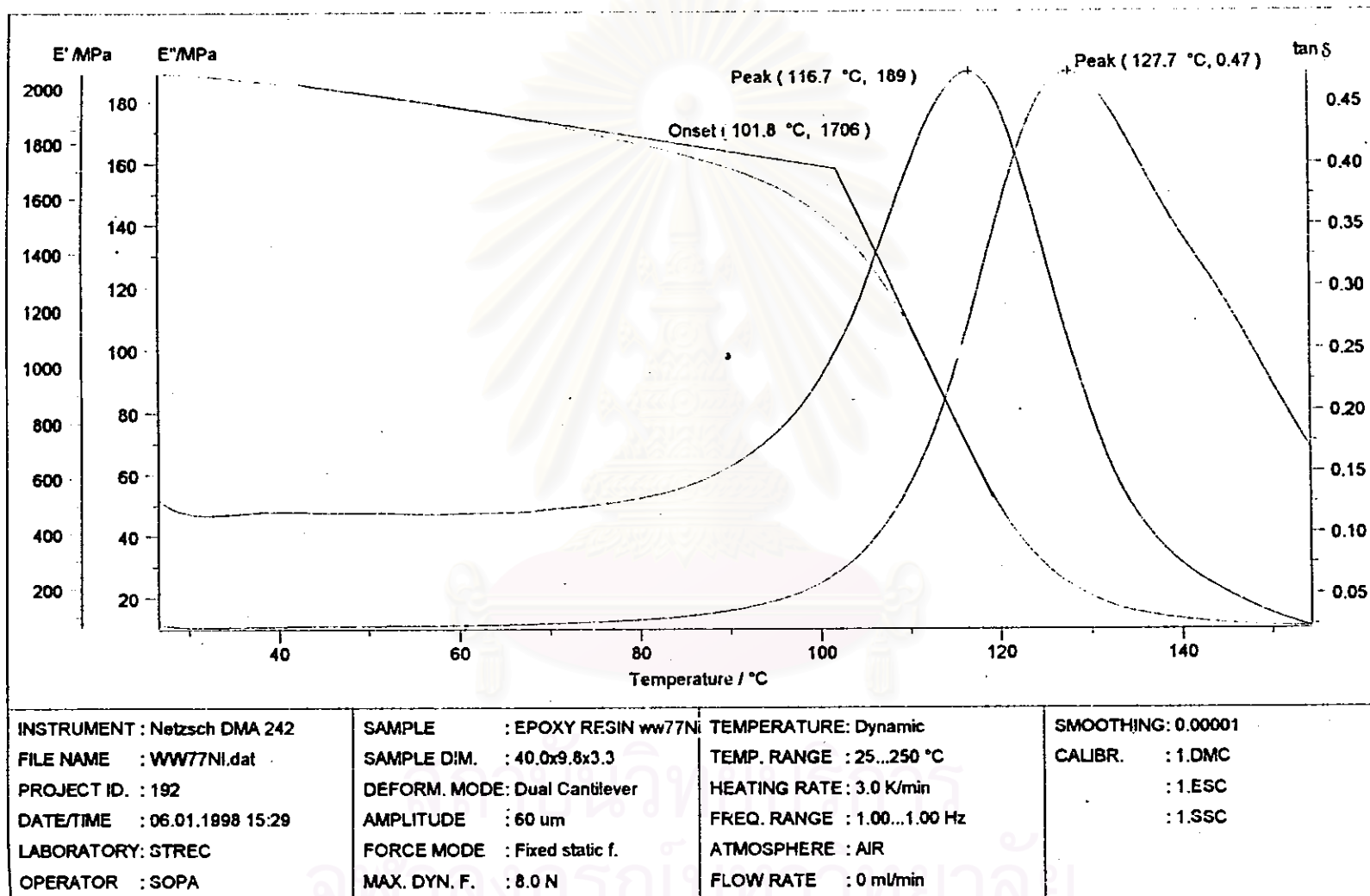


Figure A40 DMA thermogram of NiL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 8: 0.2

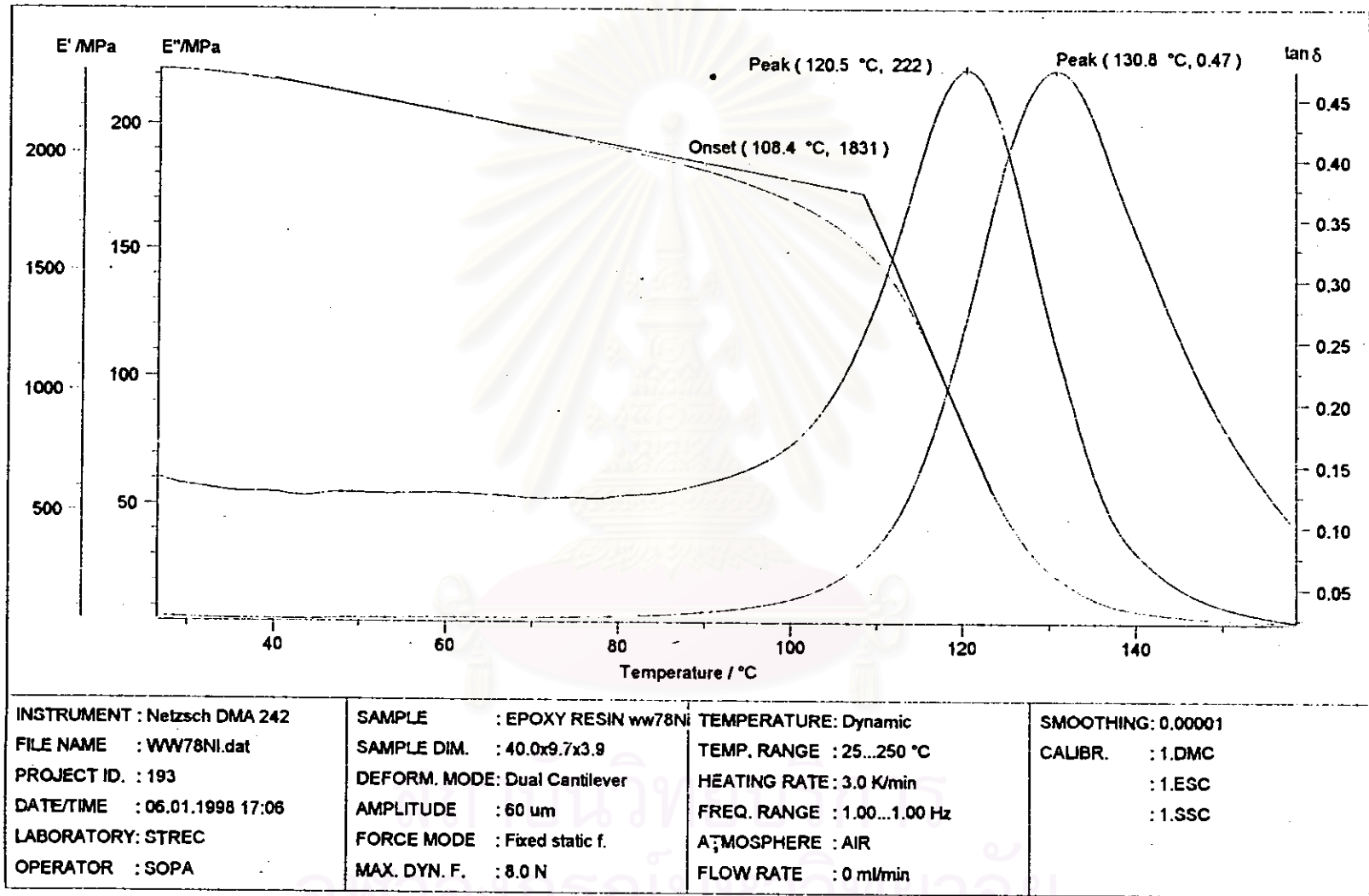


Figure A41 DMA thermogram of NiL:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 10: 0.2

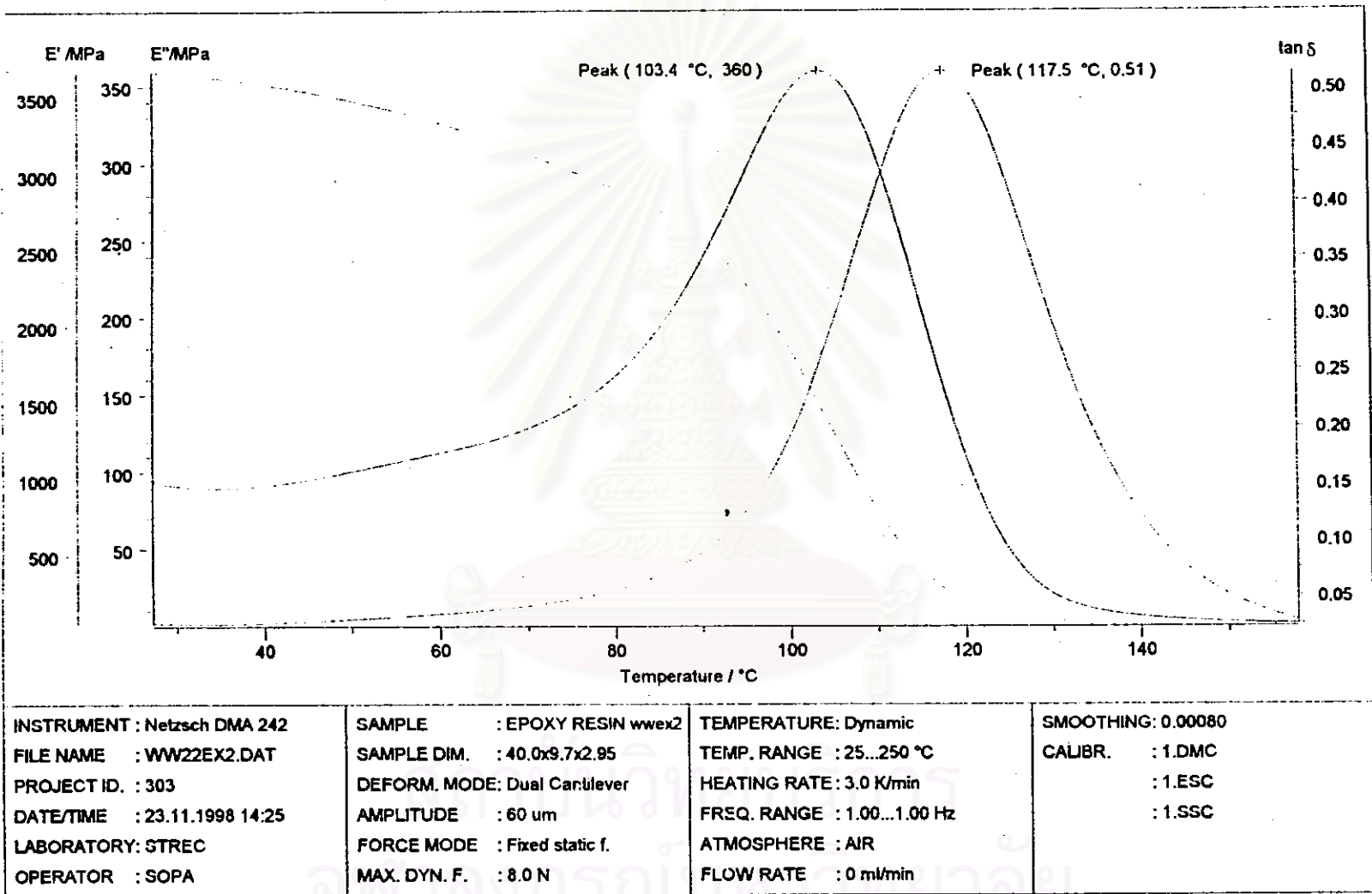


Figure A42 DMA thermogram of NiI:DGEBA:Bu₄NOH at the equivalent weight ratio of 1: 12: 0.2

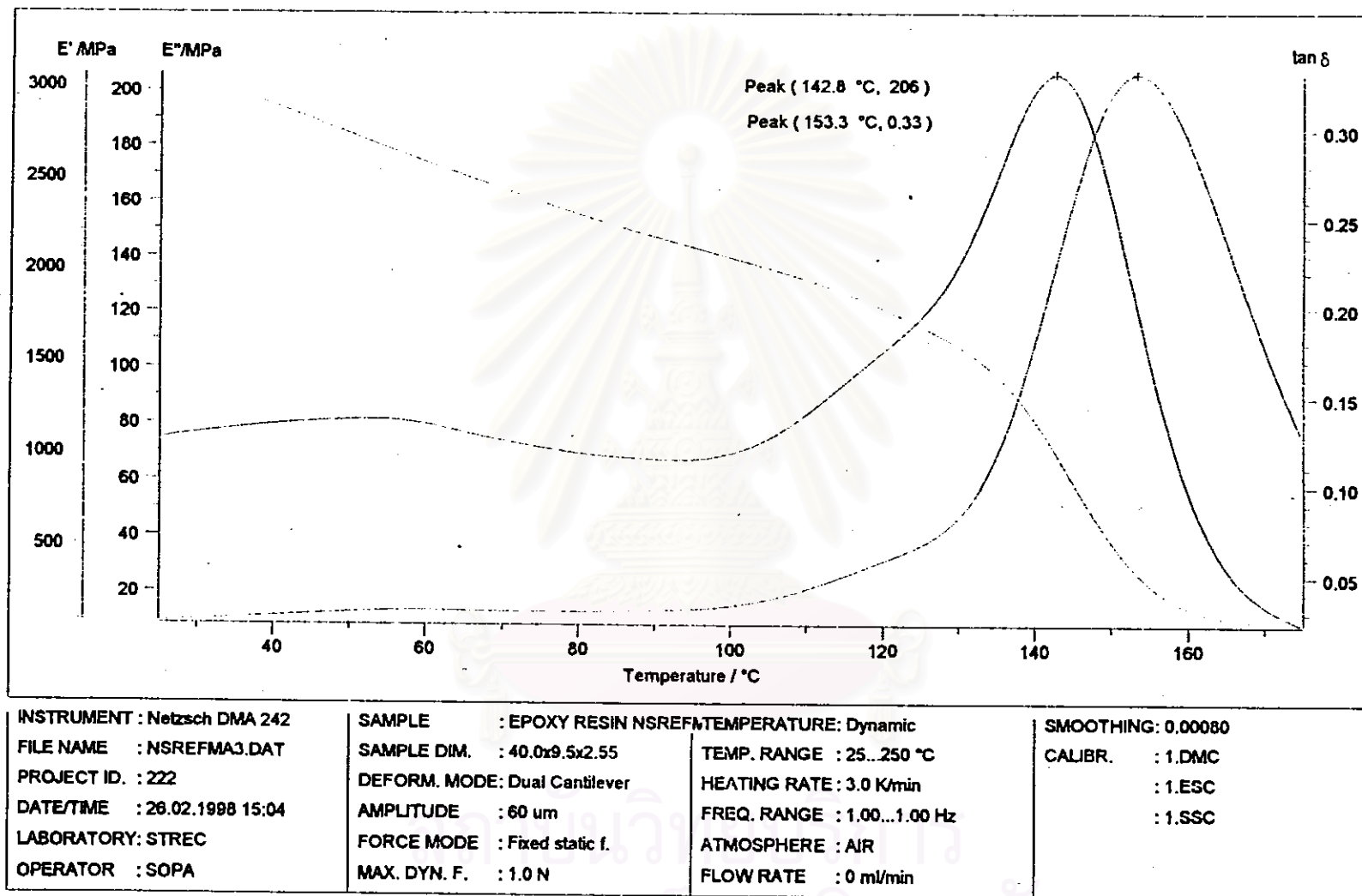
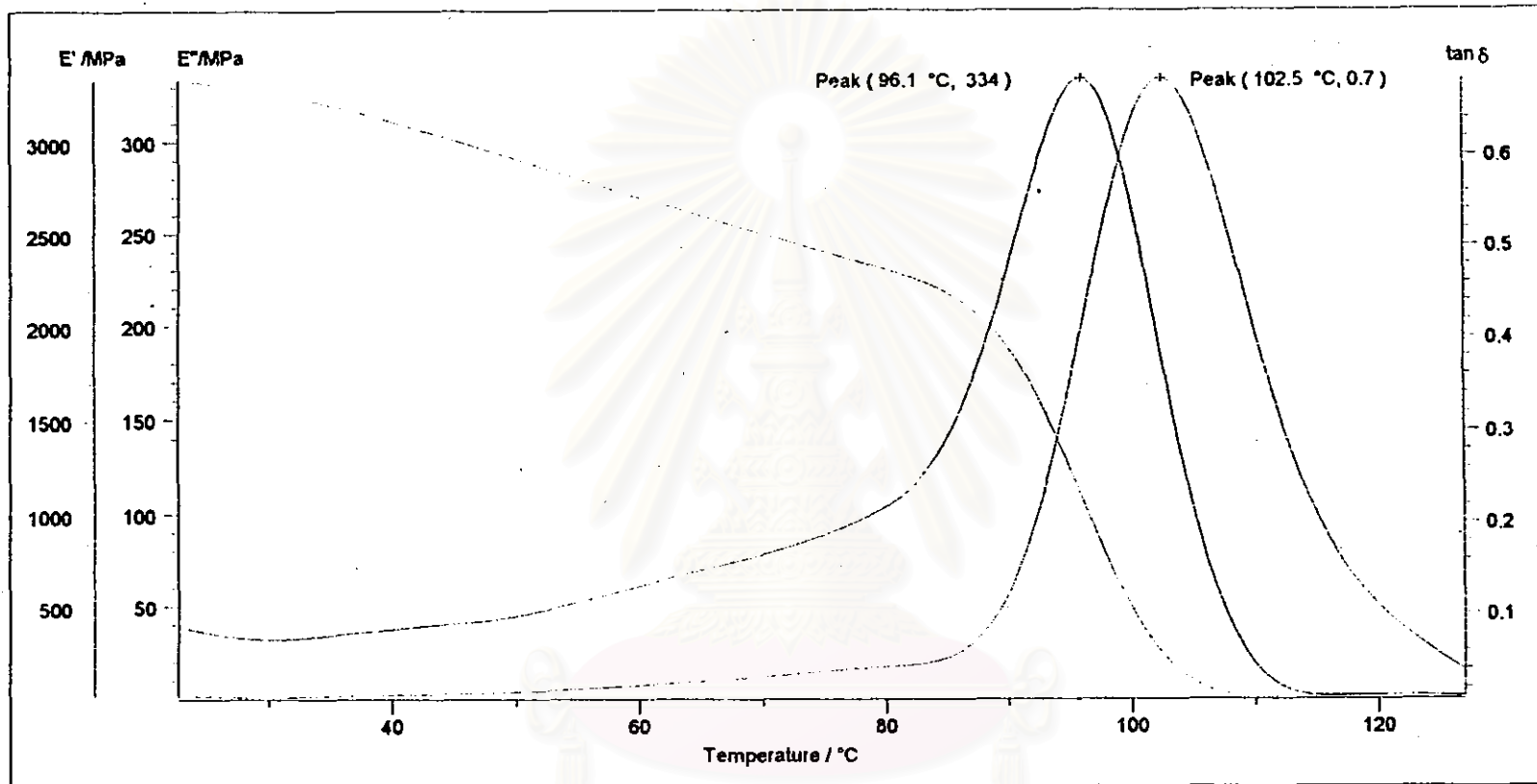


Figure A43 DMA thermogram of DGEBA : maleic anhydride at the equivalent weight ratio, of 1: 2.8 and 0.1 phr of benzyl dimethylamine



INSTRUMENT : Netzsch DMA 242	SAMPLE : EPOXY RESIN NNDTA	TEMPERATURE: Dynamic	SMOOTHING: 0.00080
FILE NAME : NNDTA2.dat	SAMPLE DIM. : 40.0x10.0x3.05	TEMP. RANGE : 25...250 °C	CALIBR. : 1.DMC
PROJECT ID. : 271	DEFORM. MODE: Dual Cantilever	HEATING RATE: 3.0 K/min	: 1.ESC
DATE/TIME : 21.08.1998 15:00	AMPLITUDE : 60 um	FREQ. RANGE : 1.00...1.00 Hz	: 1.SSC
LABORATORY: STREC	FORCE MODE : Fixed static f.	ATMOSPHERE : AIR	
OPERATOR : SOPA	MAX. DYN. F. : 1.0 N	FLOW RATE : 0 ml/min	

Figure A44 DMA thermogram of DGEBA : diethylenetriamine at the equivalent weight ratio of 1: 1

Vita

Miss Walee Wannarong was born on January 1, 1972 in Samutprakarn, Thailand. She graduated with a Bachelor degree of Science (Chemistry) from Chulalongkorn University in 1994. Since then, she joined with Bangkok Glass Industry Co., Ltd. for 2 years. In 1996, she was accepted as graduate student in the program of Petrochemistry and Polymer Science, Chulalongkorn University. She received a Master's degree of Science in 1999.



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