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APPENDIX

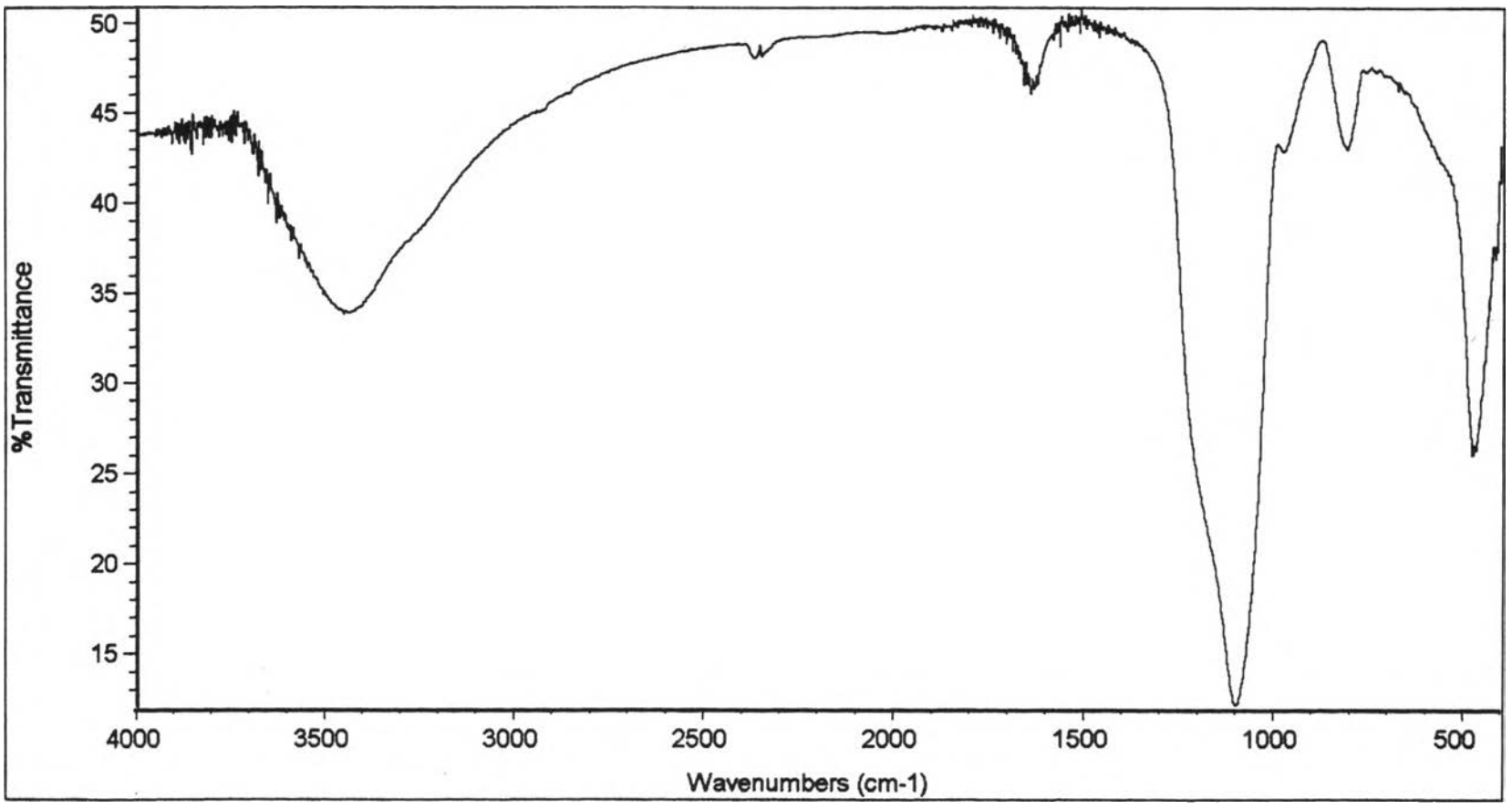


Figure A1 FT-IR Spectrum of silica, 0.007 μm, from Aldrich Chemical Co., Inc.,

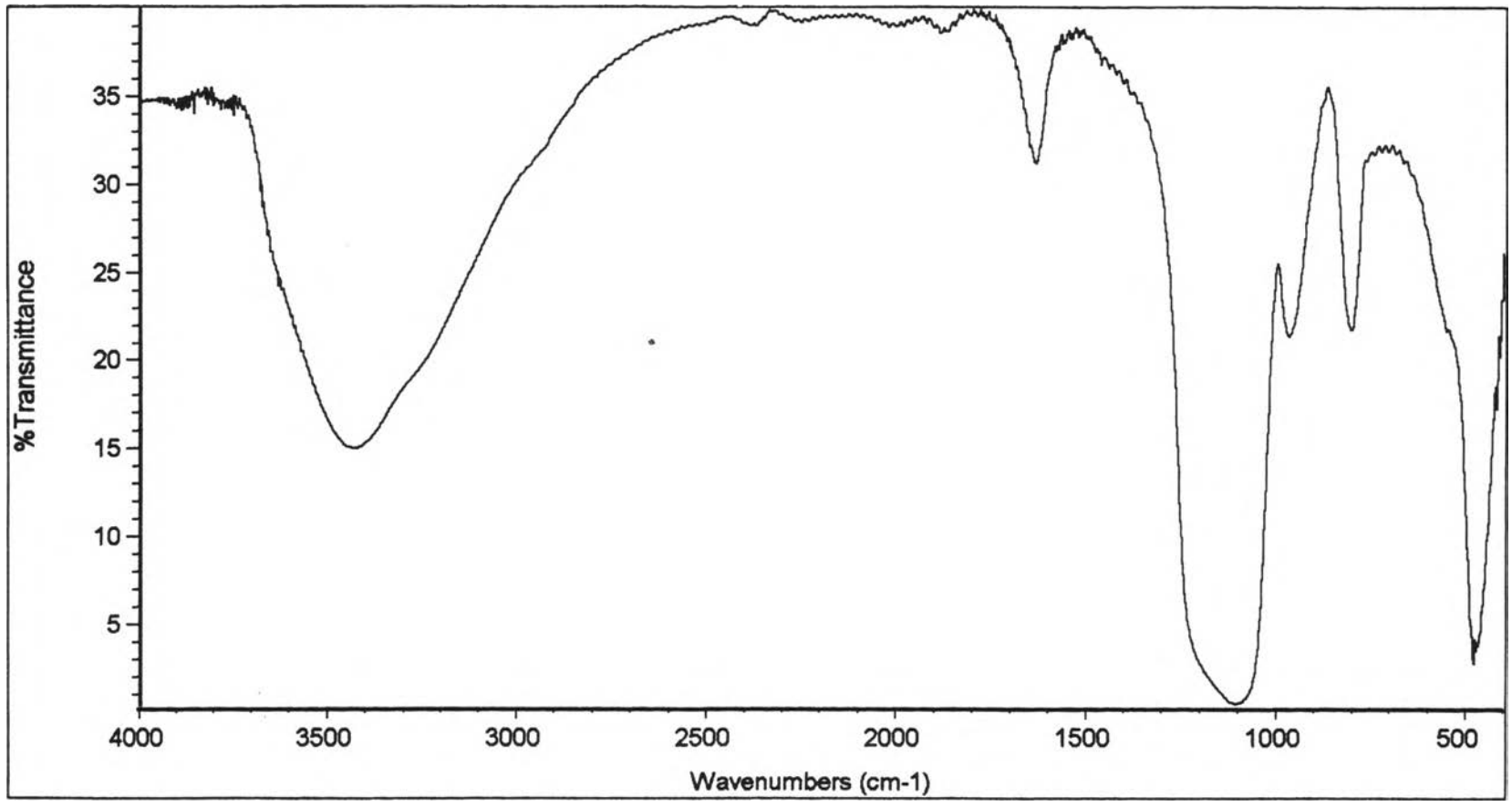


Figure A2 FT-IR Spectrum of silica, 10.97 μm, from PPG Siam Silica Co., Ltd.

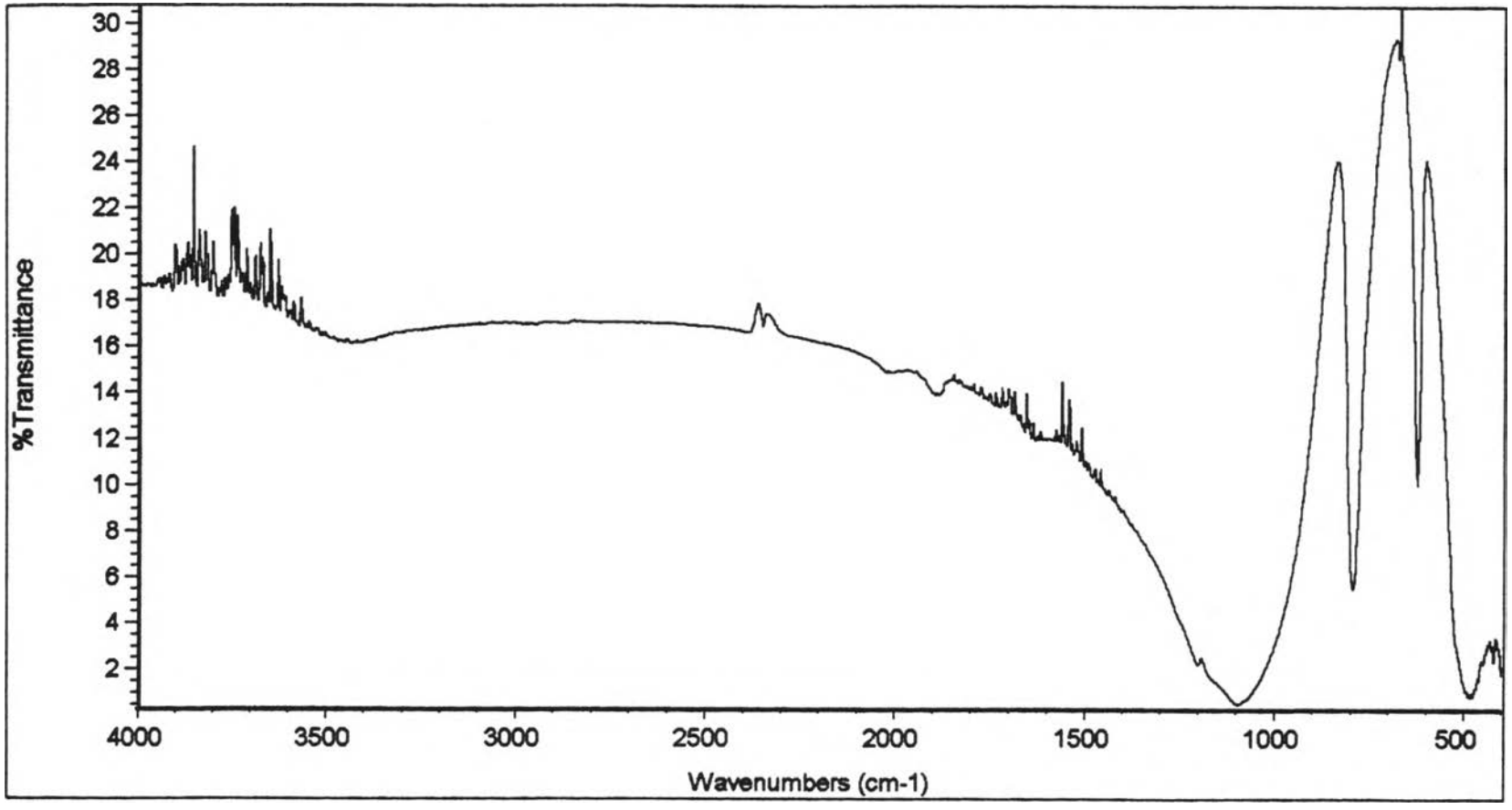


Figure A3 FT-IR Spectrum of rice husk ash, 13.47 μm.

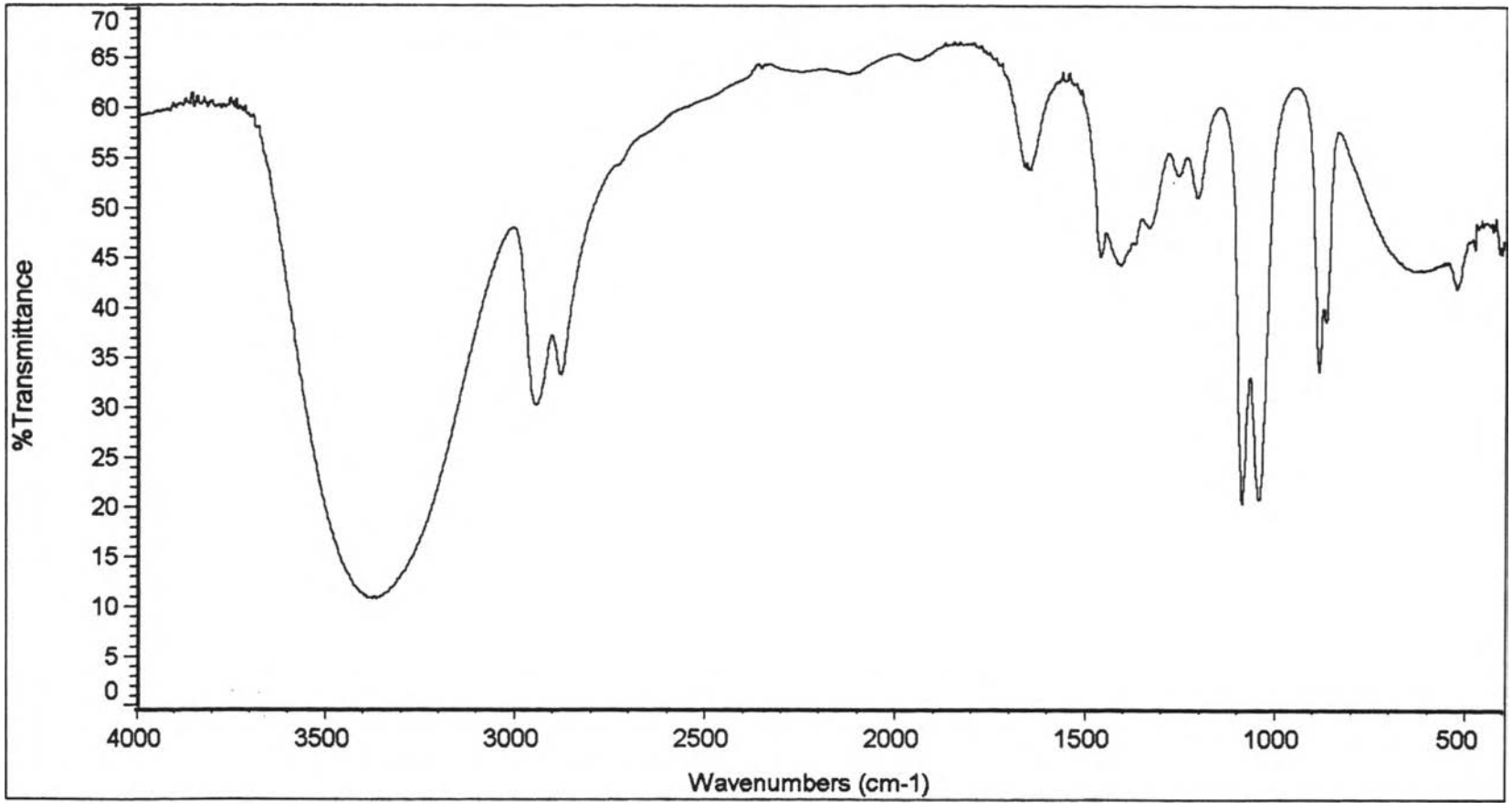


Figure A4 FT-IR Spectrum of ethylene glycol (EG)

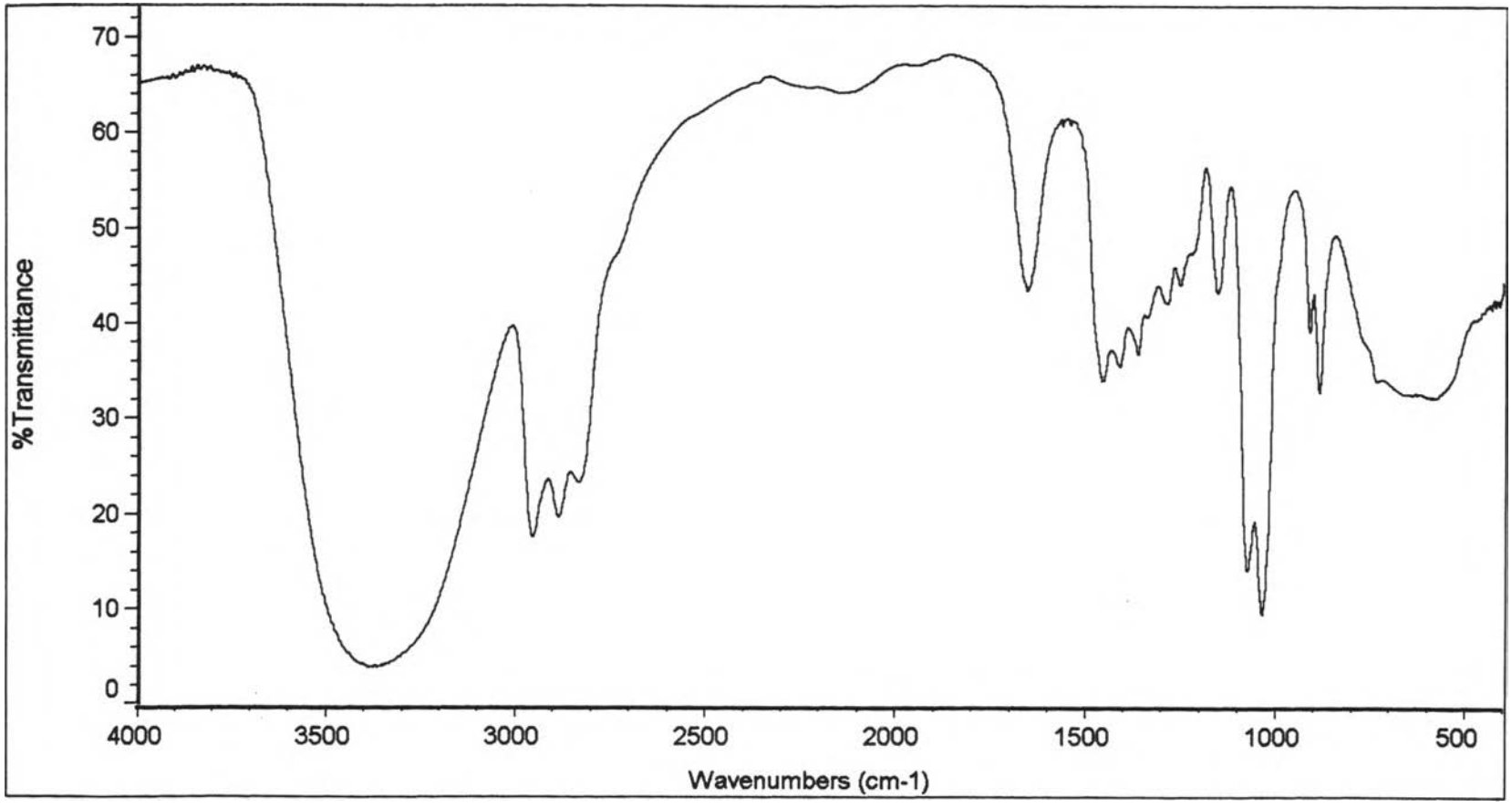


Figure A5 FT-IR Spectrum of triethanolamine (TEA)

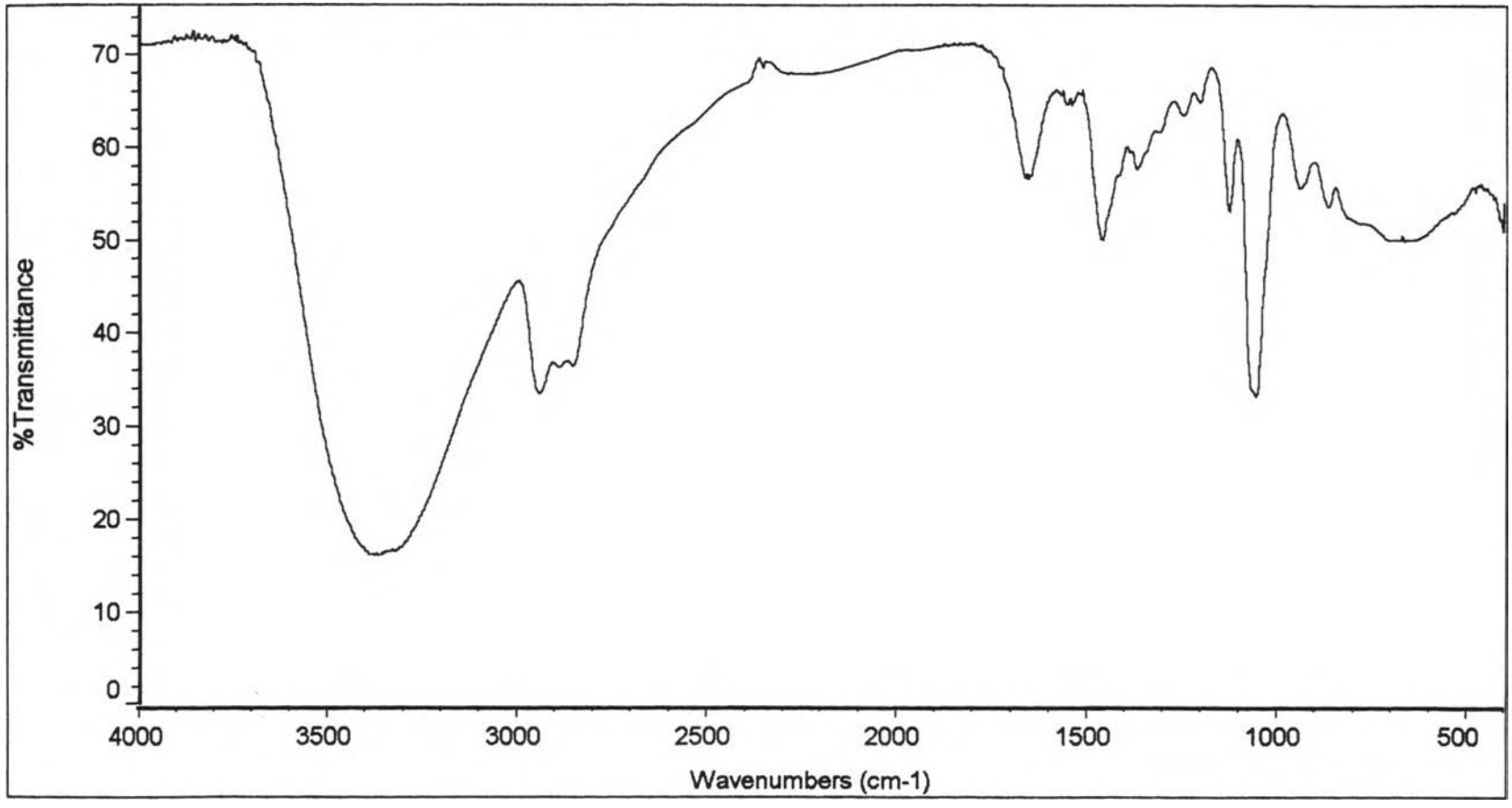


Figure A6 FT-IR Spectrum of diethanolamine (DEA)

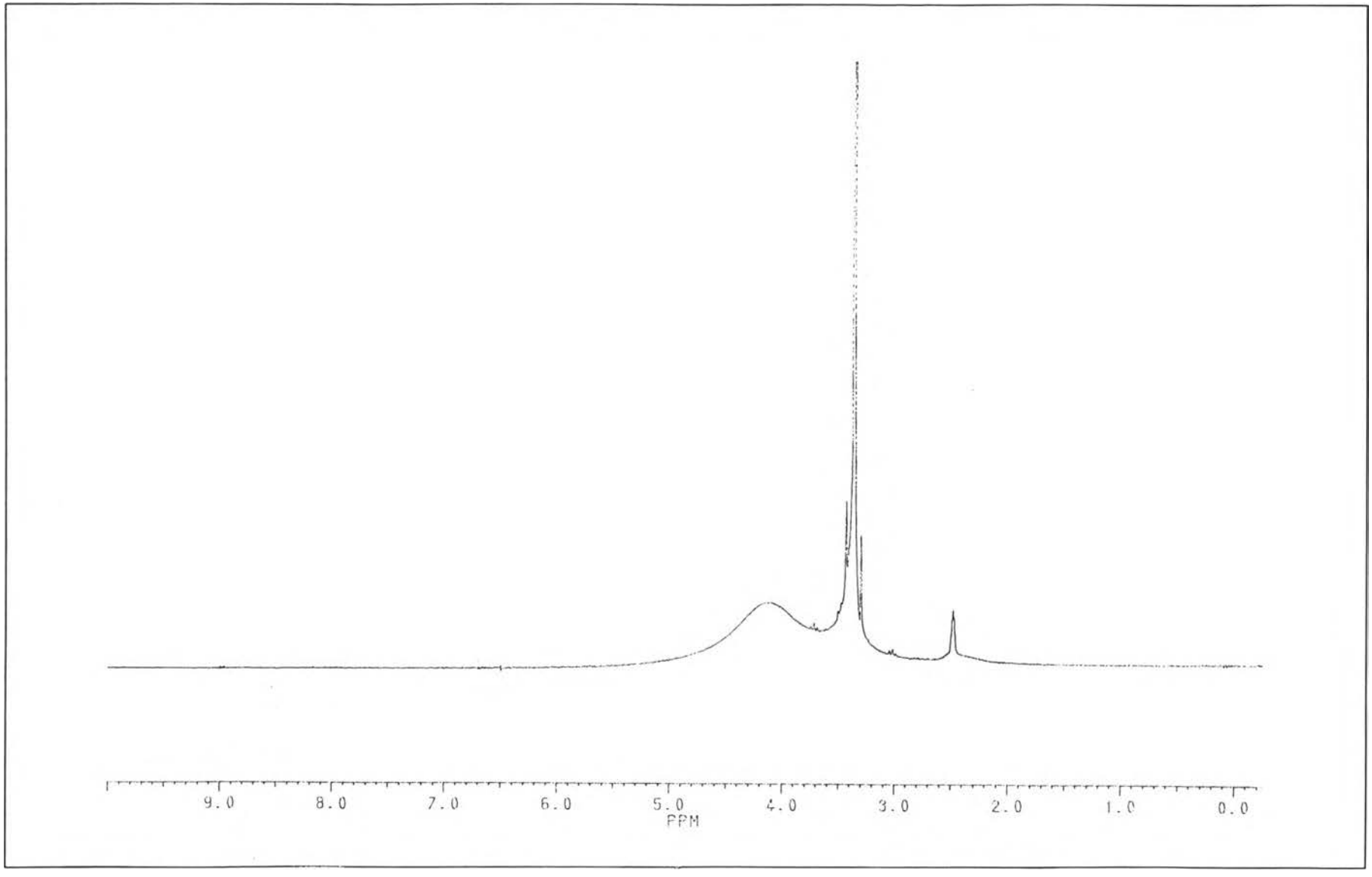


Figure A7 ^{1}H-NMR (d_6-DMSO) Spectrum of EG

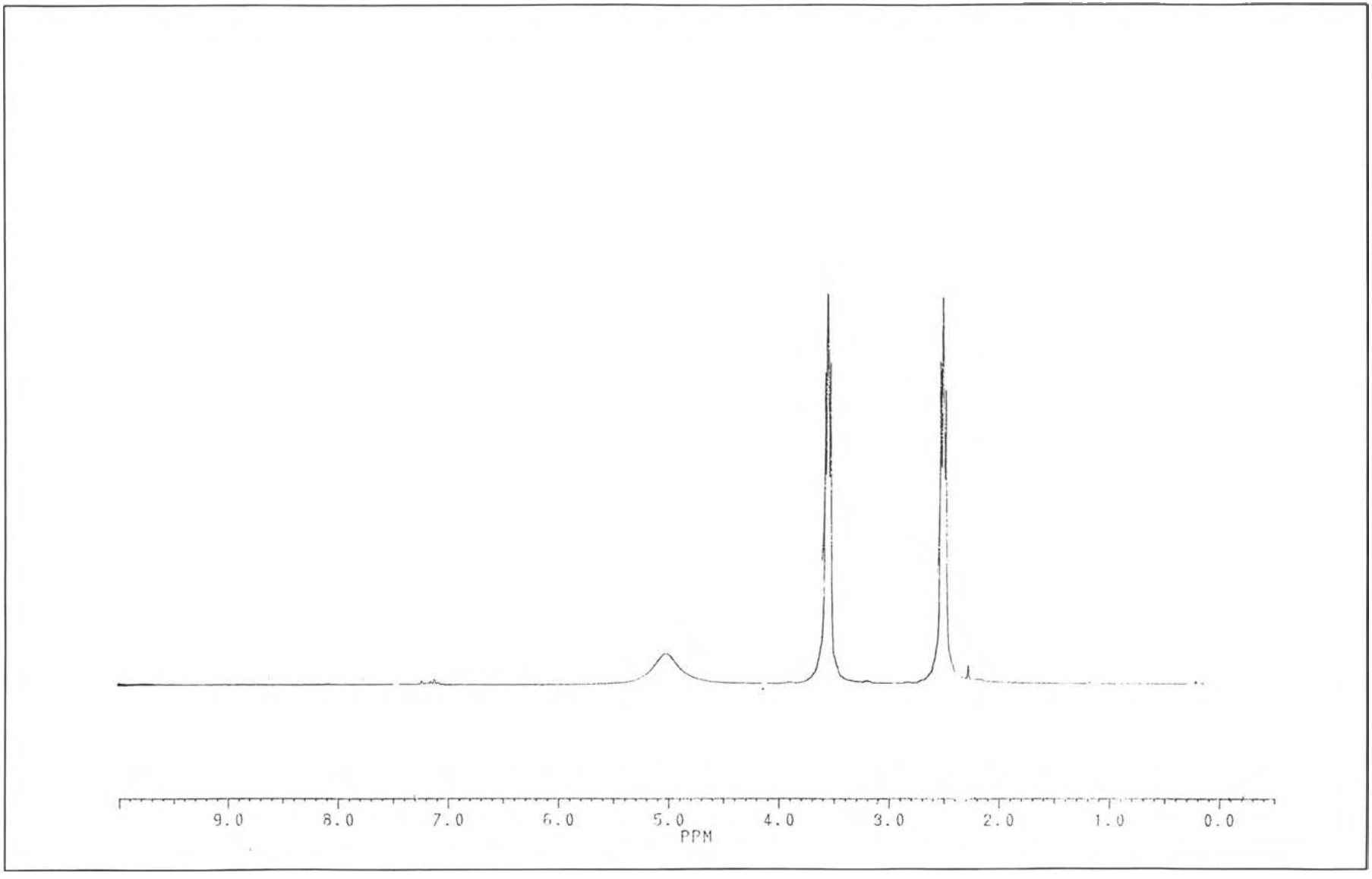


Figure A8 ^{1}H-NMR (d_6-DMSO) Spectrum of TEA

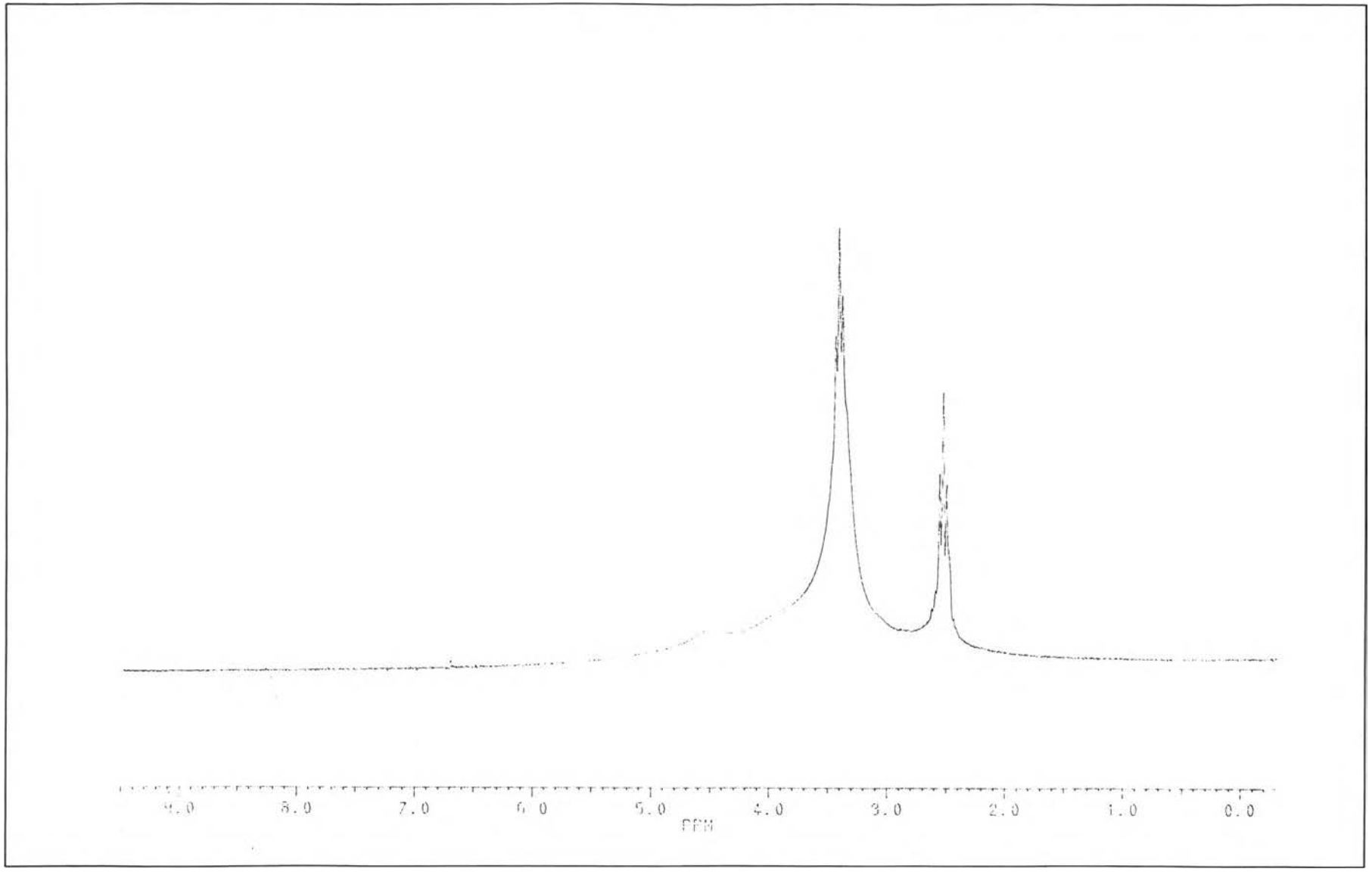


Figure A9 ^{1}H-NMR (d_6-DMSO) Spectrum of DEA

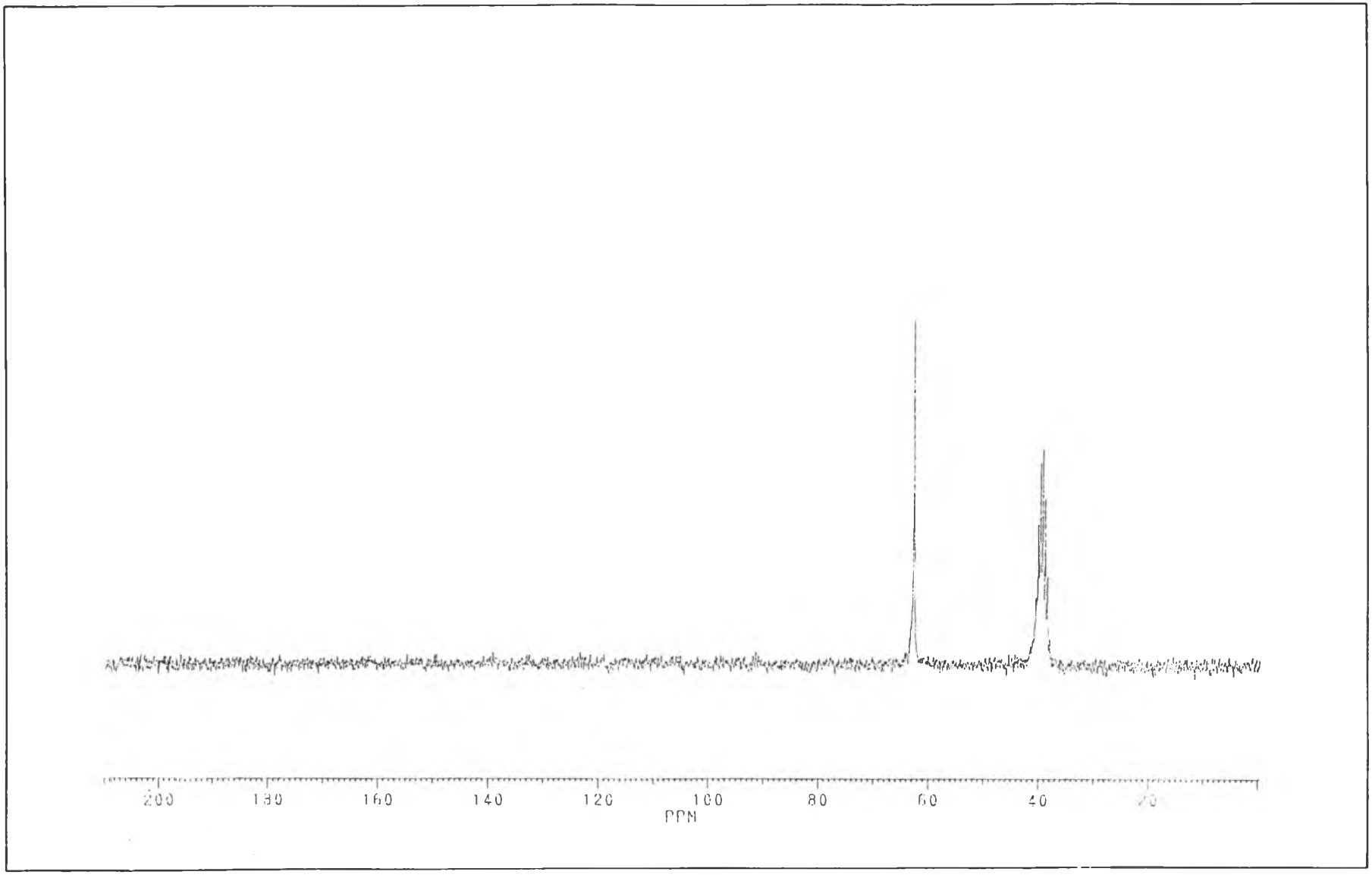


Figure A10 ^{13}C-NMR (d_6-DMSO) Spectrum of EG

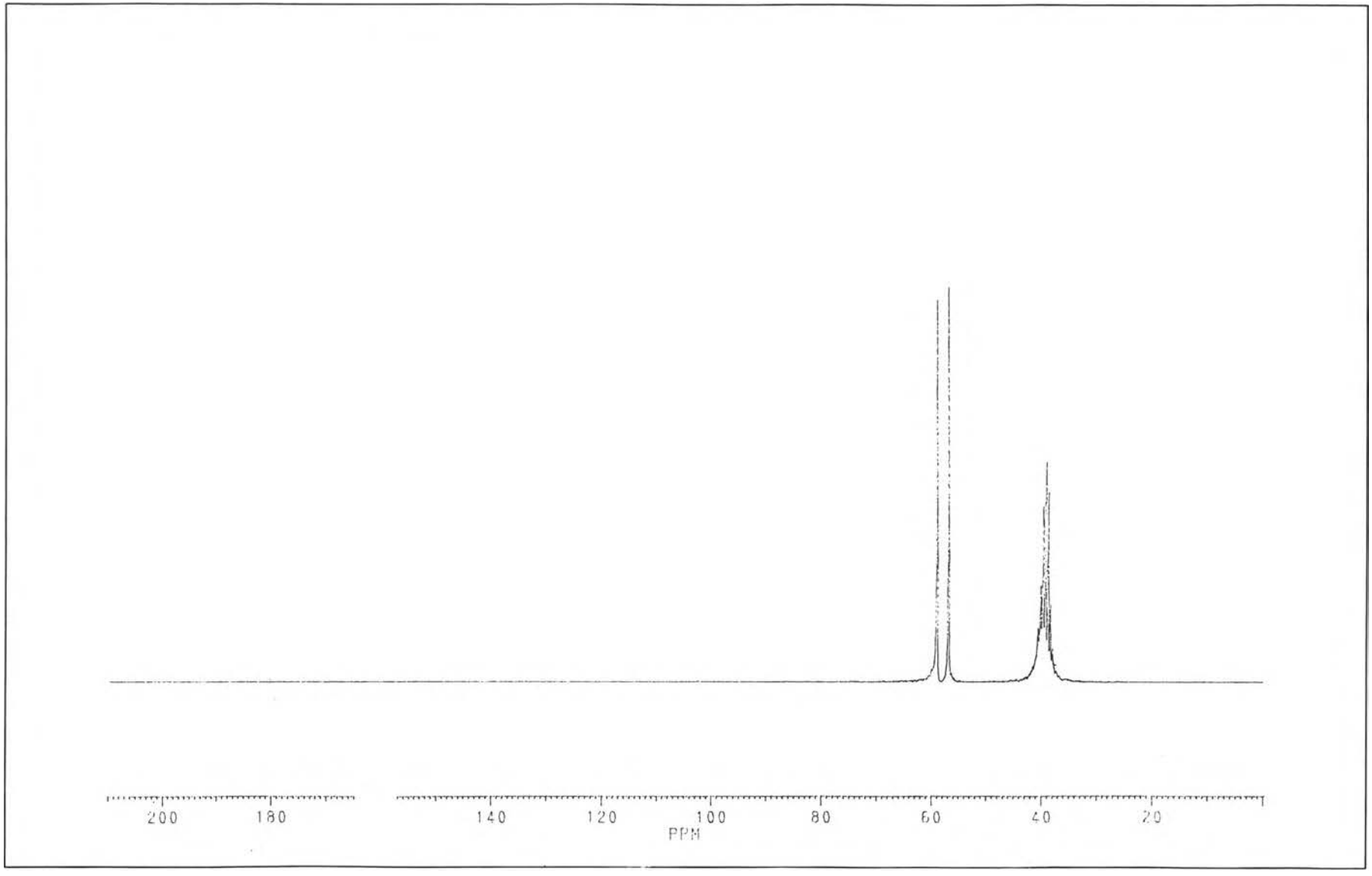


Figure A11 ^{13}C-NMR (d_6-DMSO) Spectrum of TEA

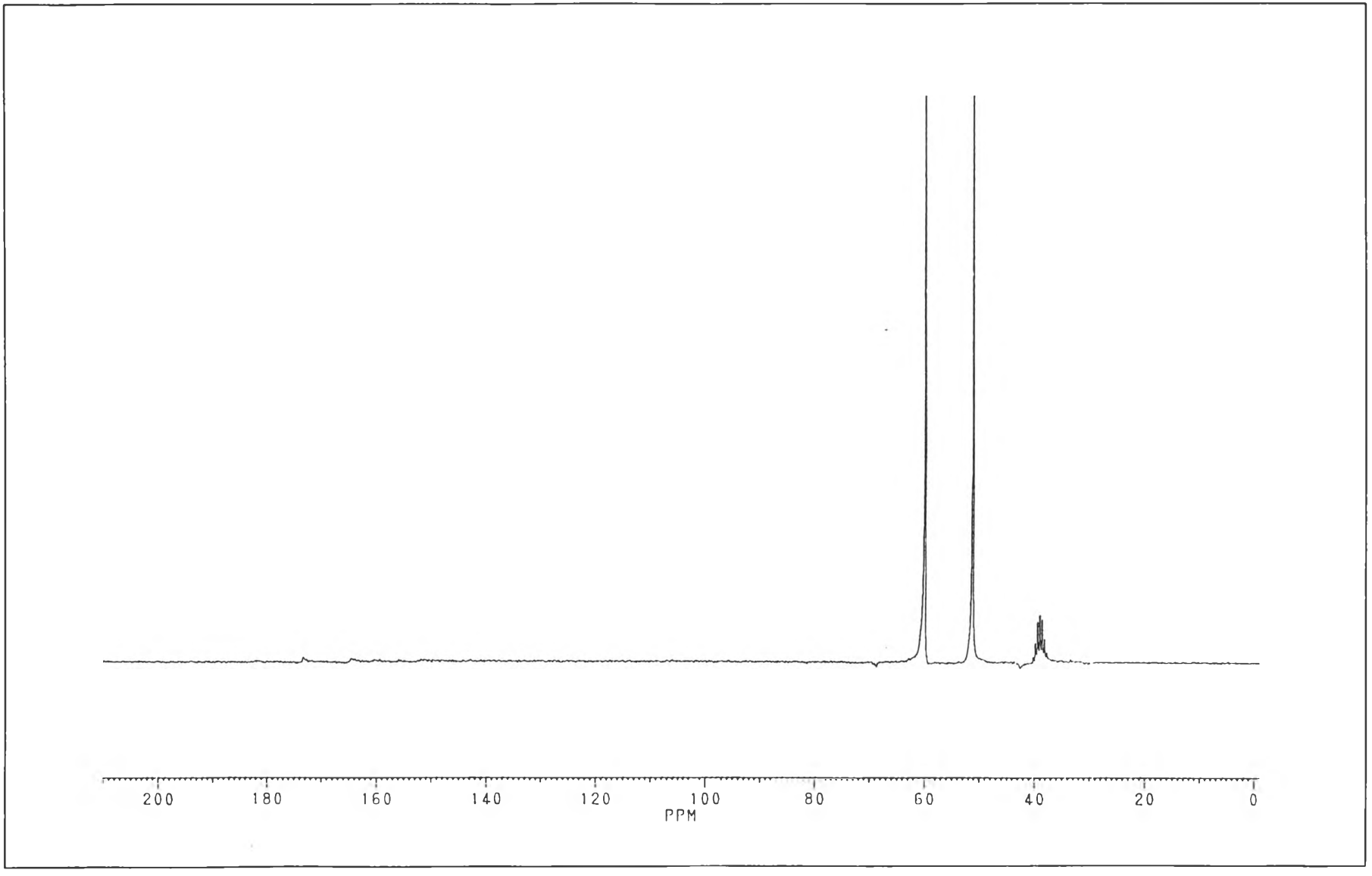


Figure A12 ^{13}C-NMR (d_6-DMSO) Spectrum of DEA

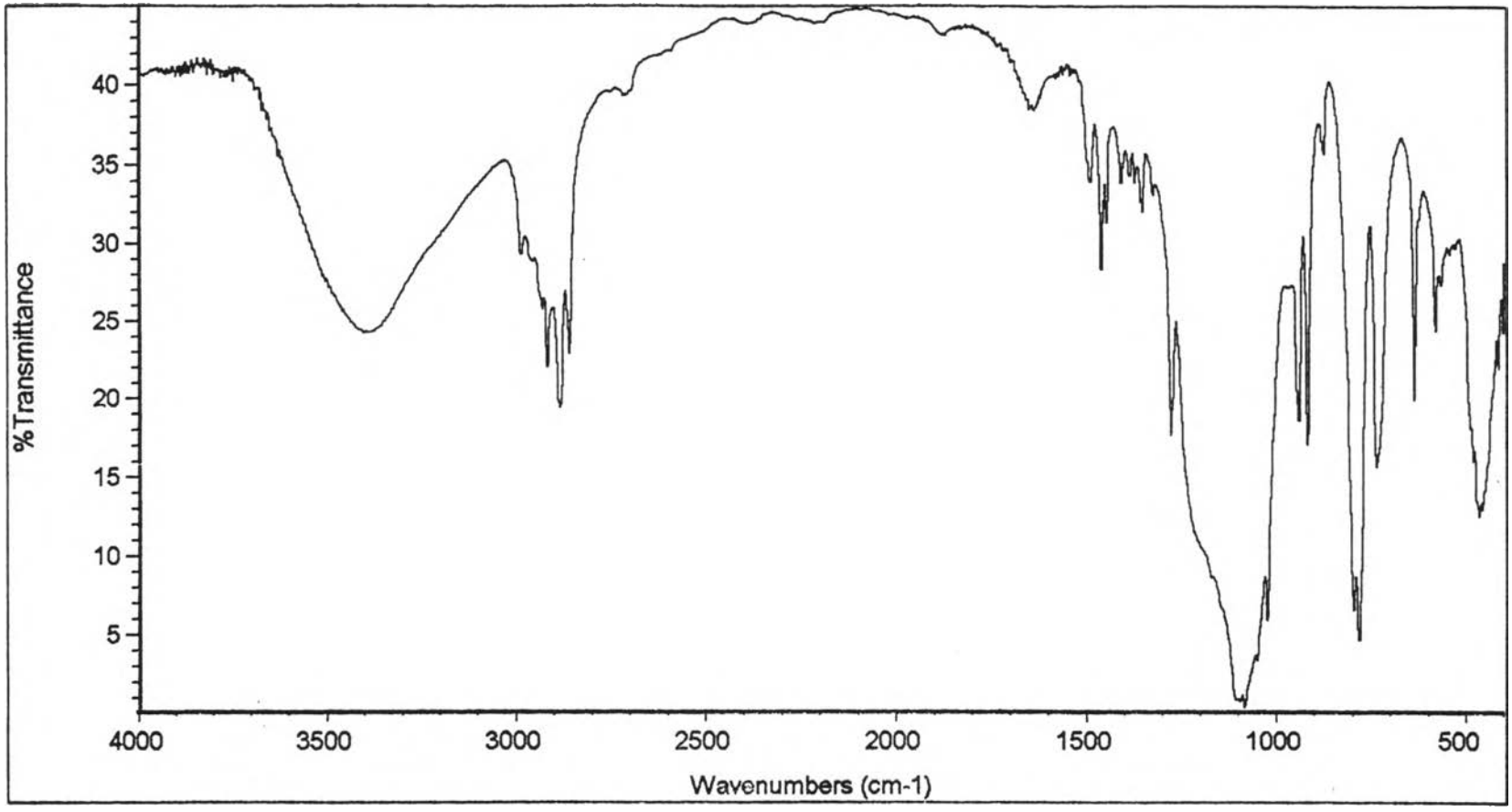


Figure A13 FT-IR Spectrum of sample 1 synthesized from silica 0.007 μm, TEA and EG.

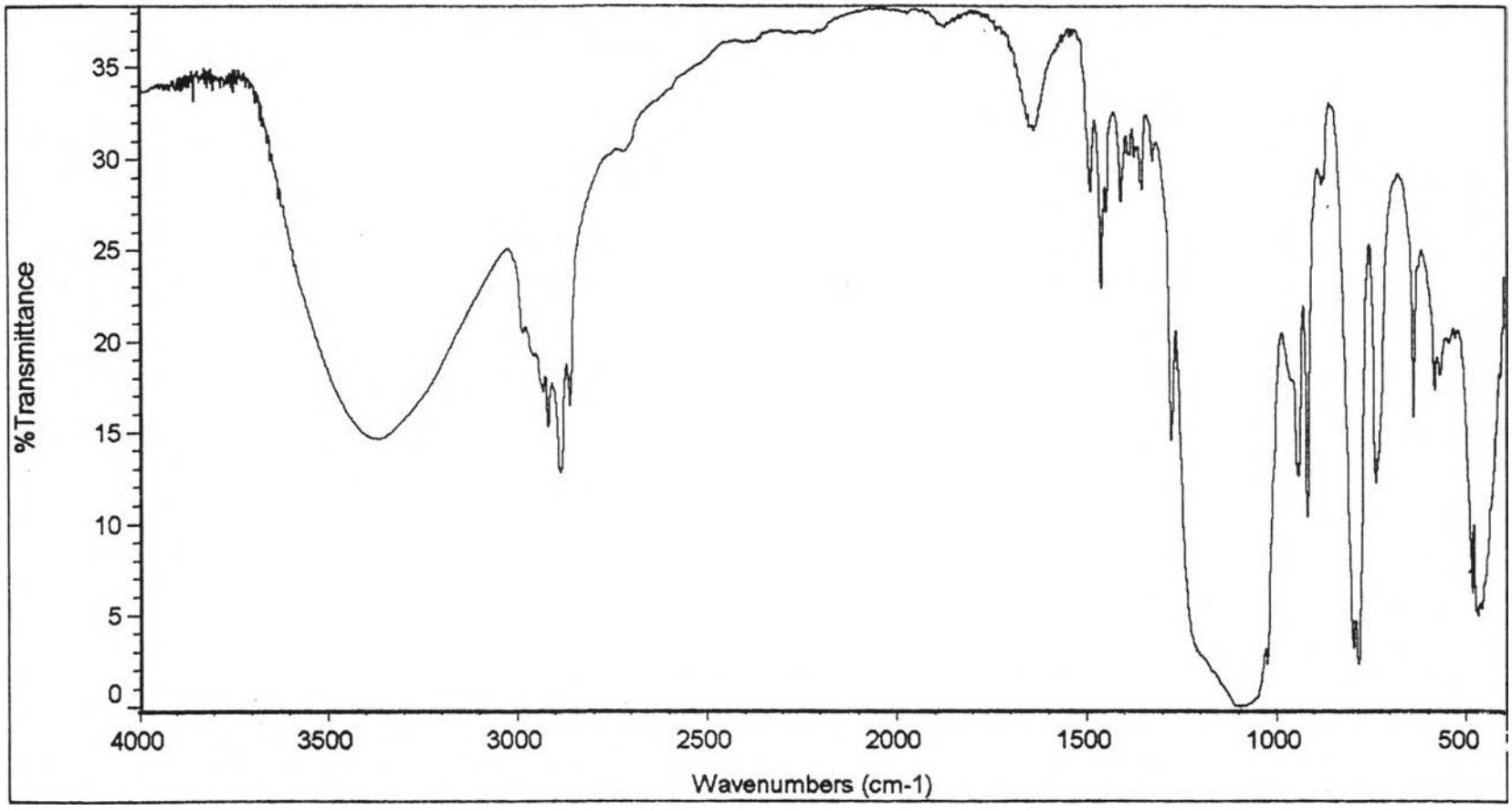


Figure A14 FT-IR Spectrum of sample 2 synthesized from silica 10.97 μm, TEA and EG.

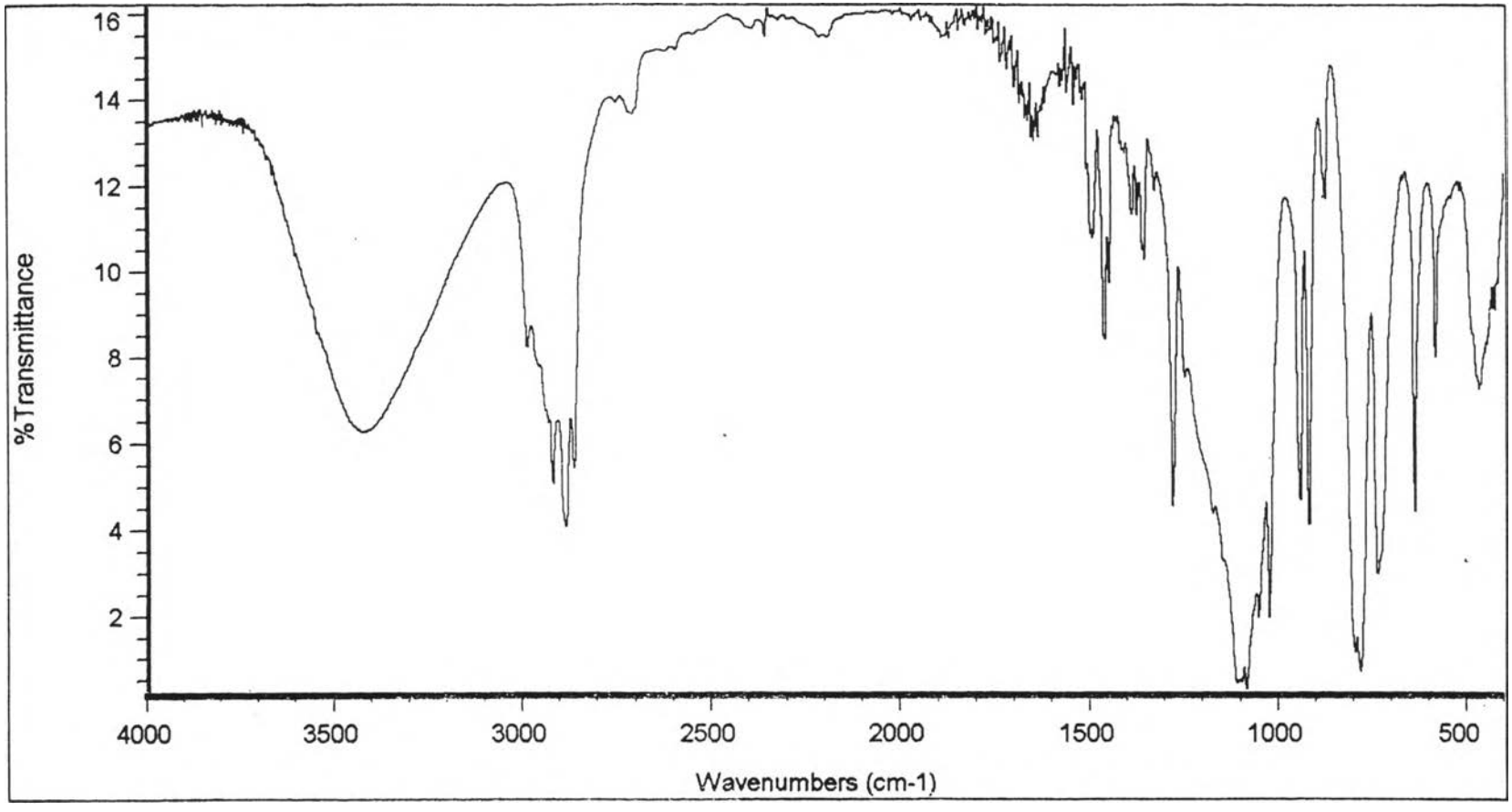


Figure A15 FT-IR Spectrum of sample 3 synthesized from rice husk ash 10.97 μm, TEA and EG

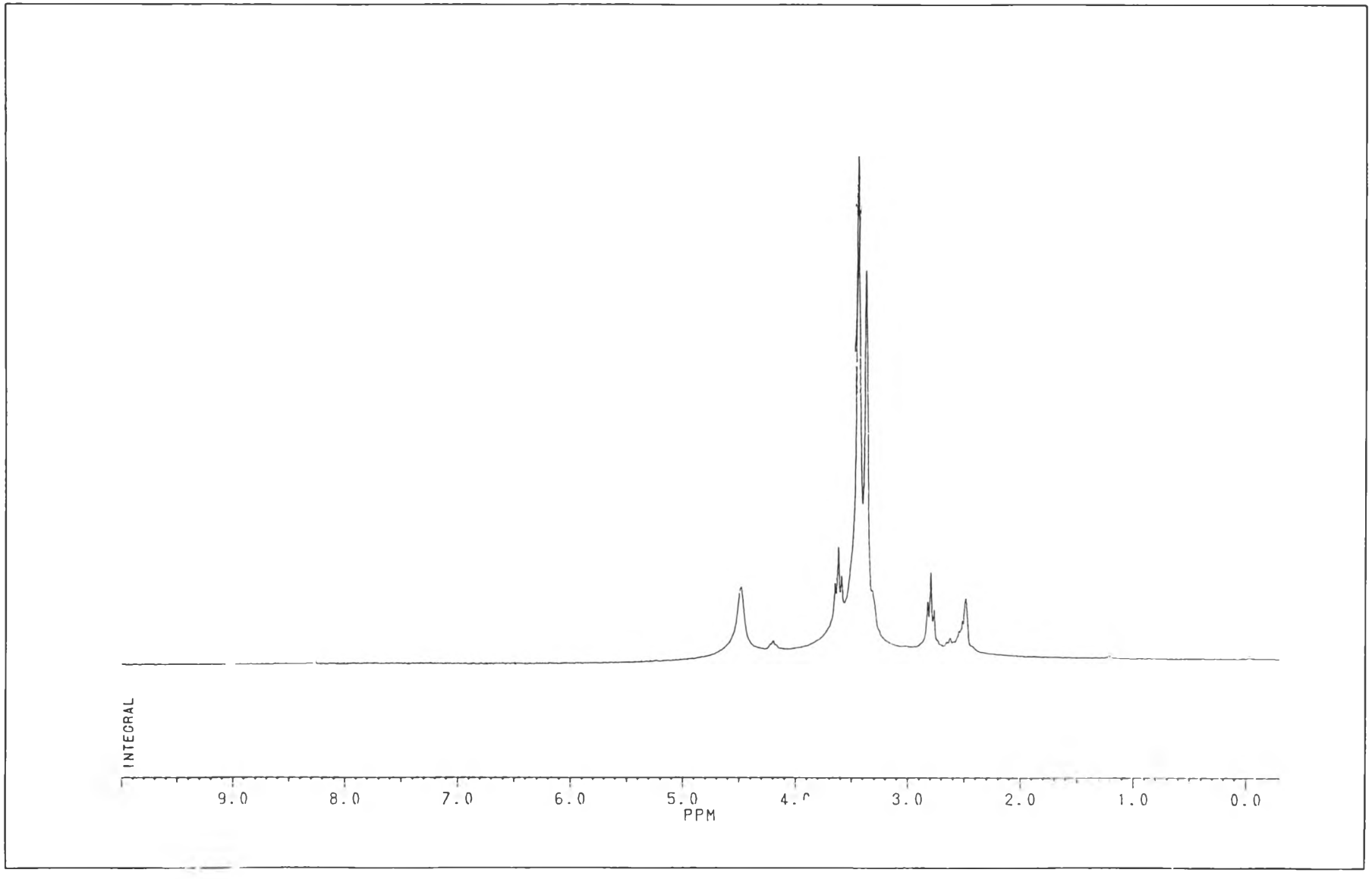


Figure A16 ^{1}H-NMR (d_6-DMSO) Spectrum of sample 1 synthesized from silica 0.007 μm, TEA and EG.

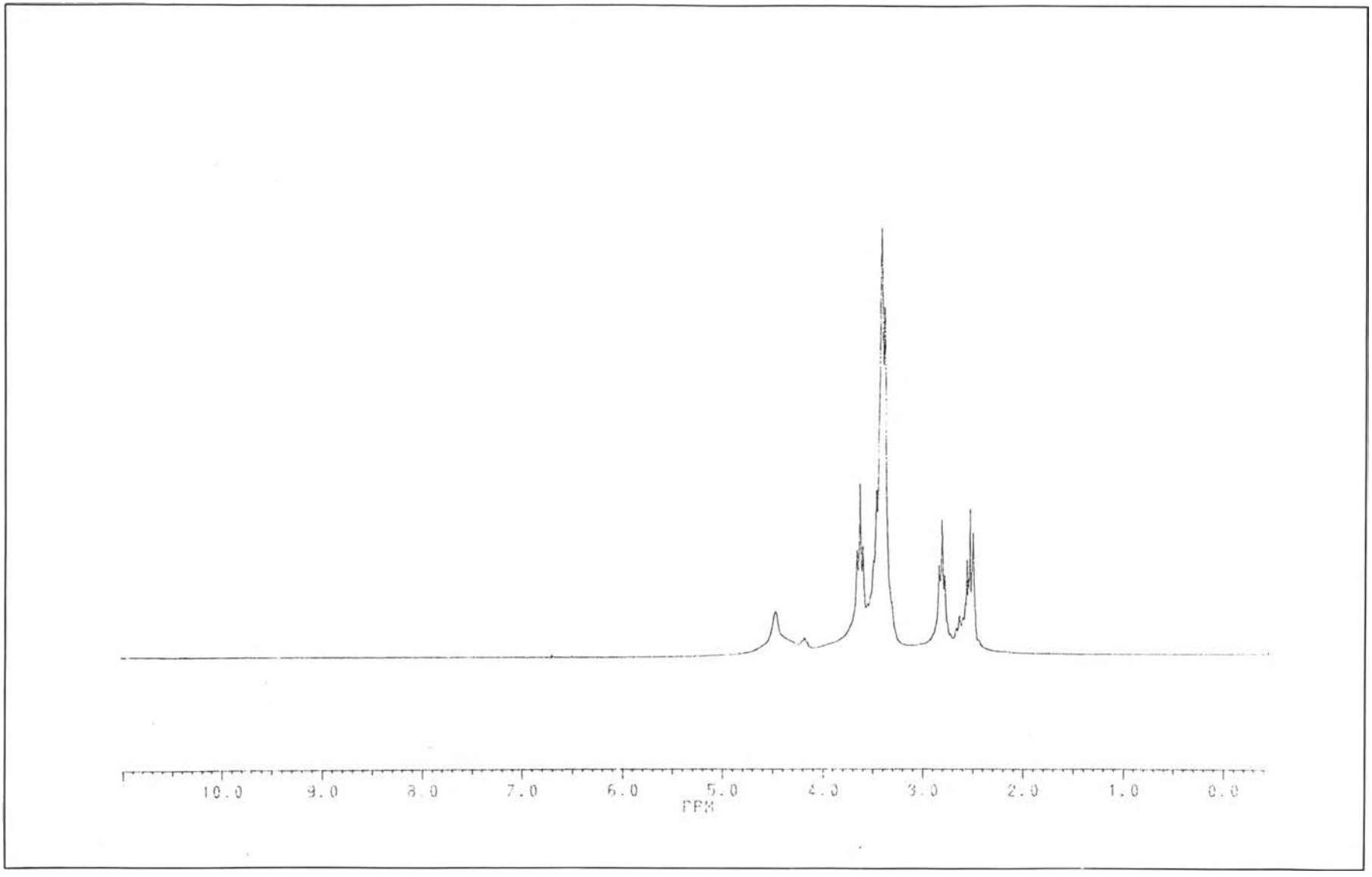


Figure A17 ^{1}H-NMR (d_6-DMSO) Spectrum of sample 2 synthesized from silica 10.97 μm, TEA and EG.

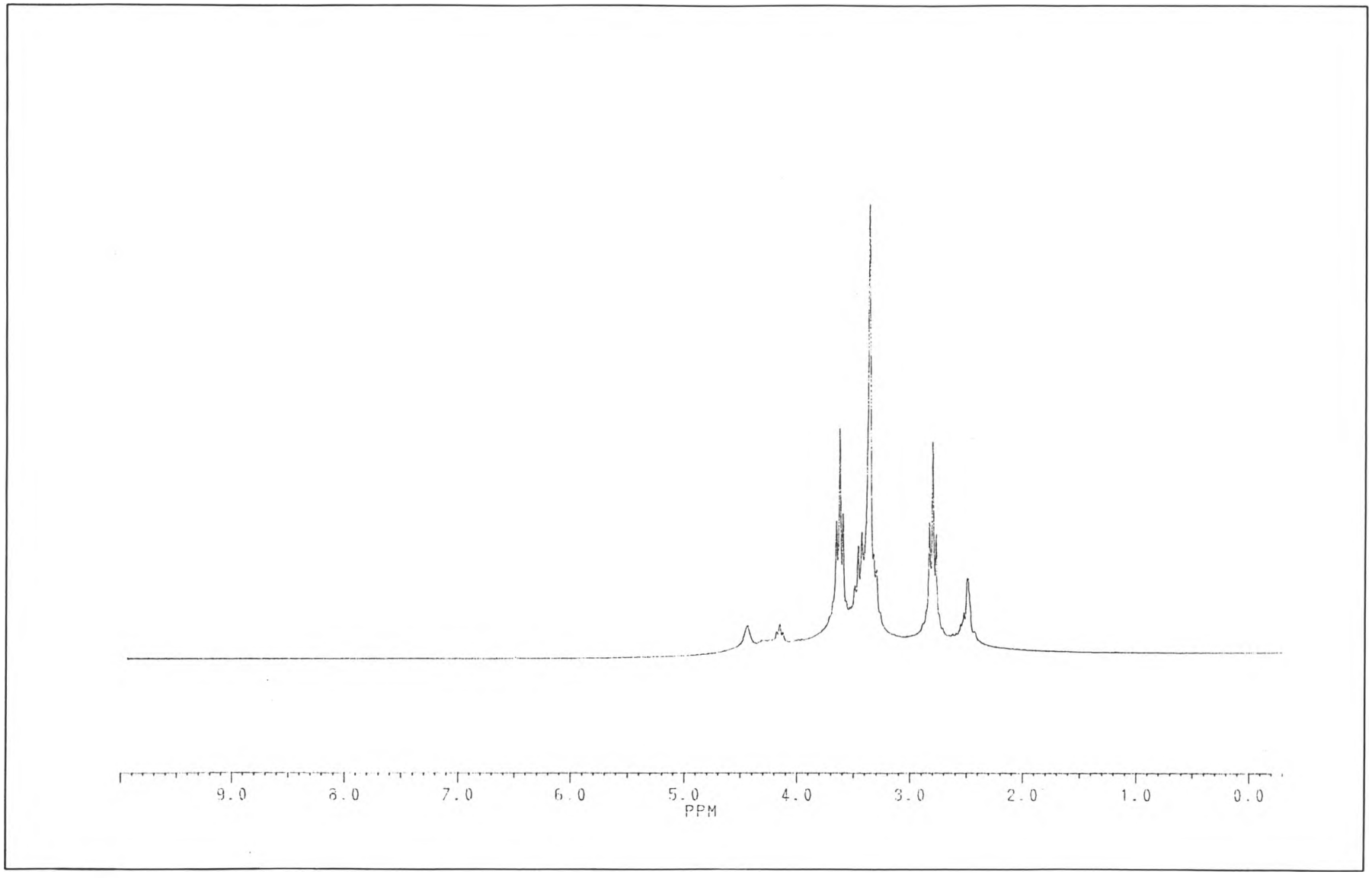


Figure A18 ^{1}H-NMR (d_6-DMSO) Spectrum of sample 3 synthesized from rice husk ash 13.47 μm, TEA and EG.

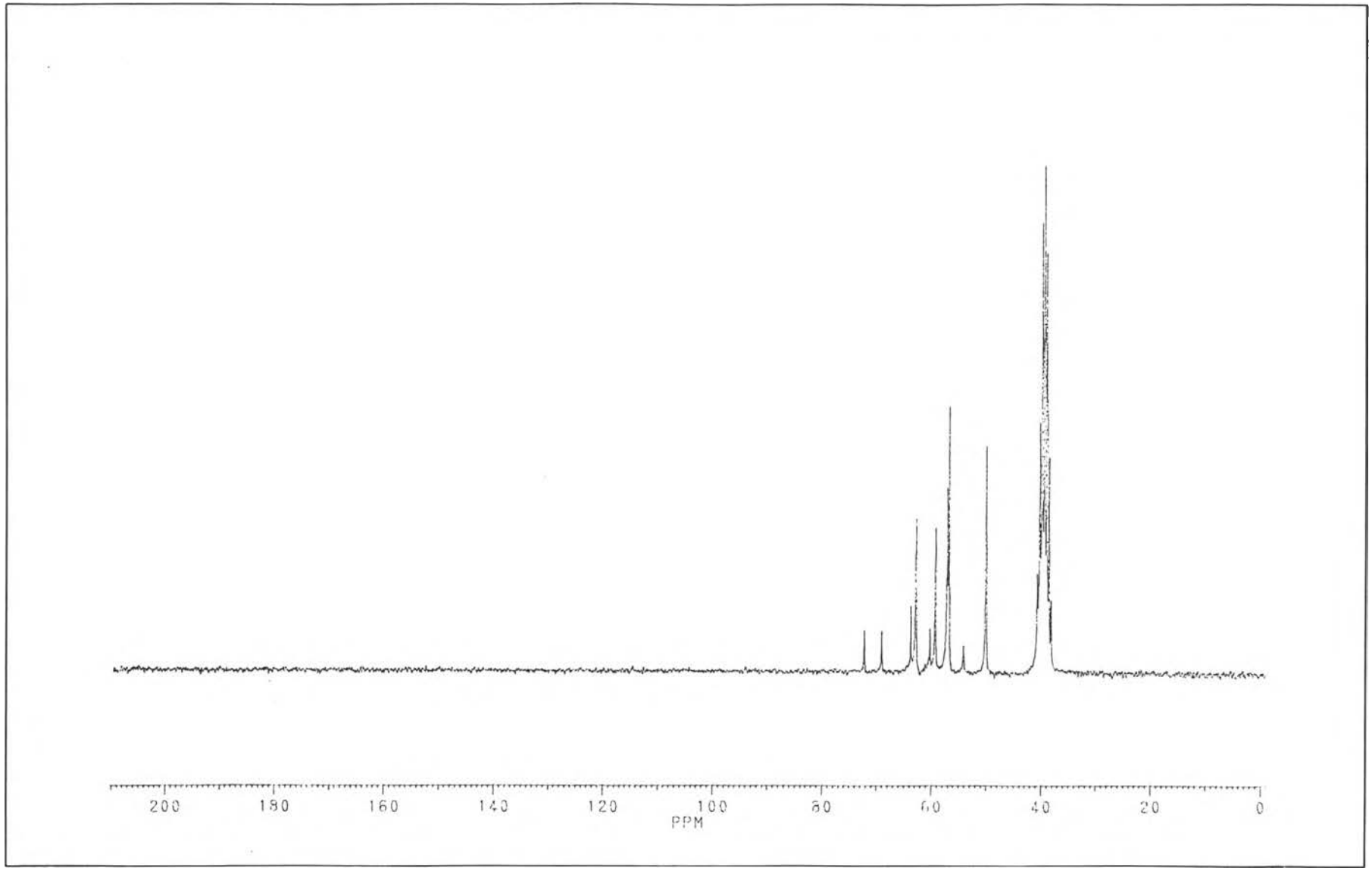


Figure A19 ^{13}C-NMR (d_6-DMSO) Spectrum of sample 1 synthesized from silica 0.007 μm, TEAand EG.

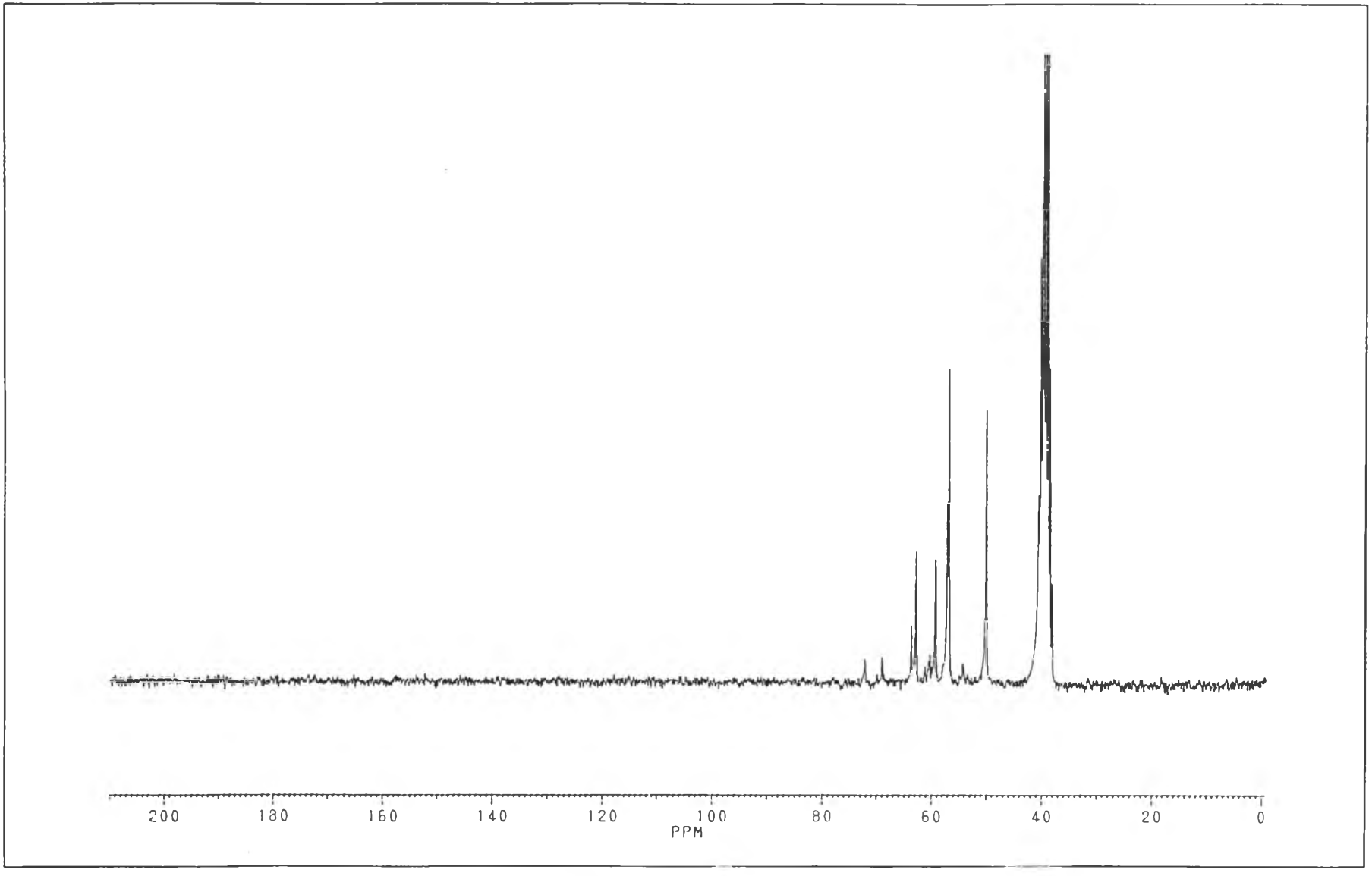


Figure A20 ^{13}C-NMR (d_6-DMSO) Spectrum of sample 2 synthesized from silica 10.97 µm, TEA and EG

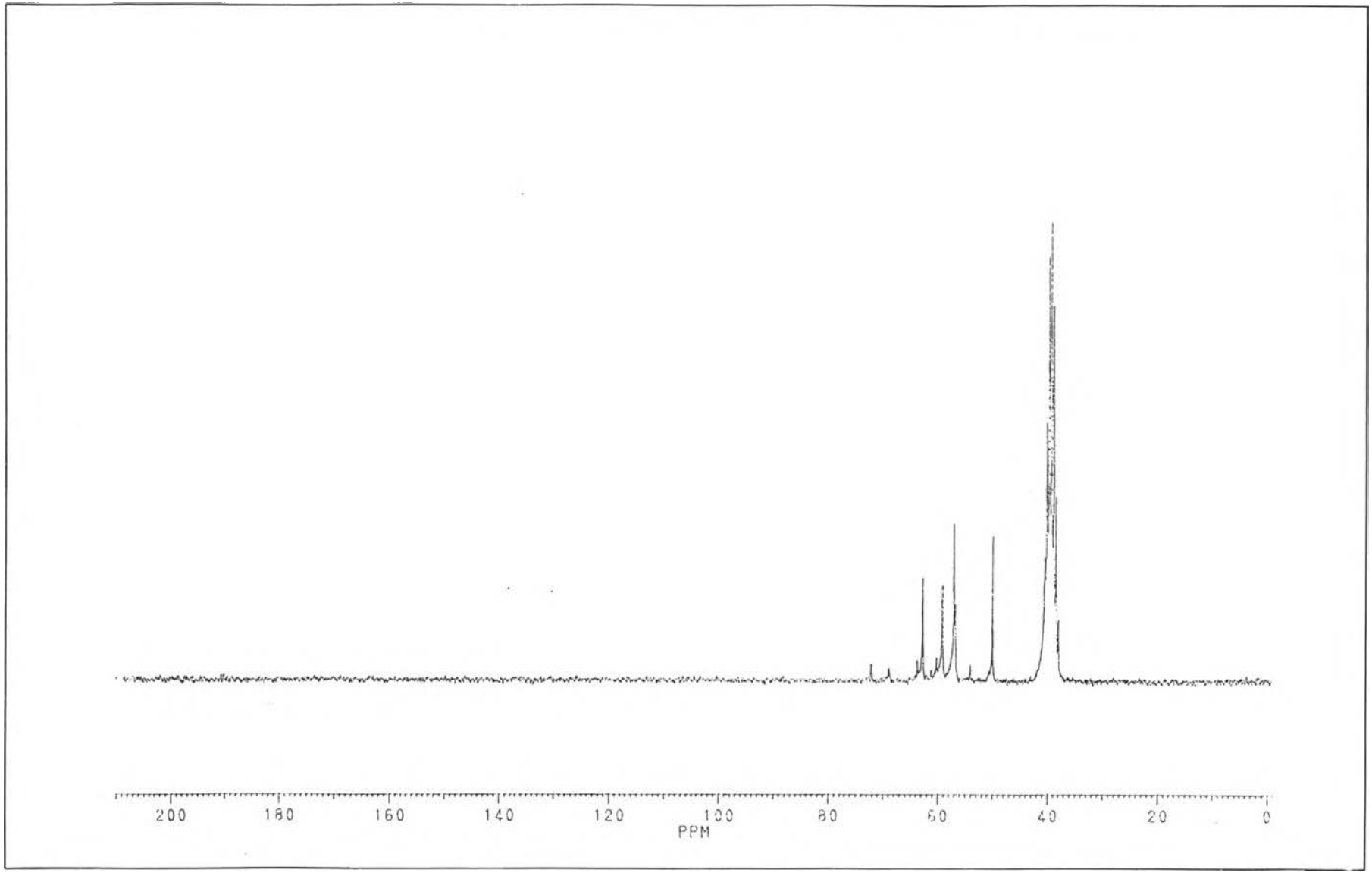


Figure A21 ^{13}C-NMR (d_6-DMSO) Spectrum of sample 3 synthesized from rice husk ash 13.47 µm, TEA and EG.

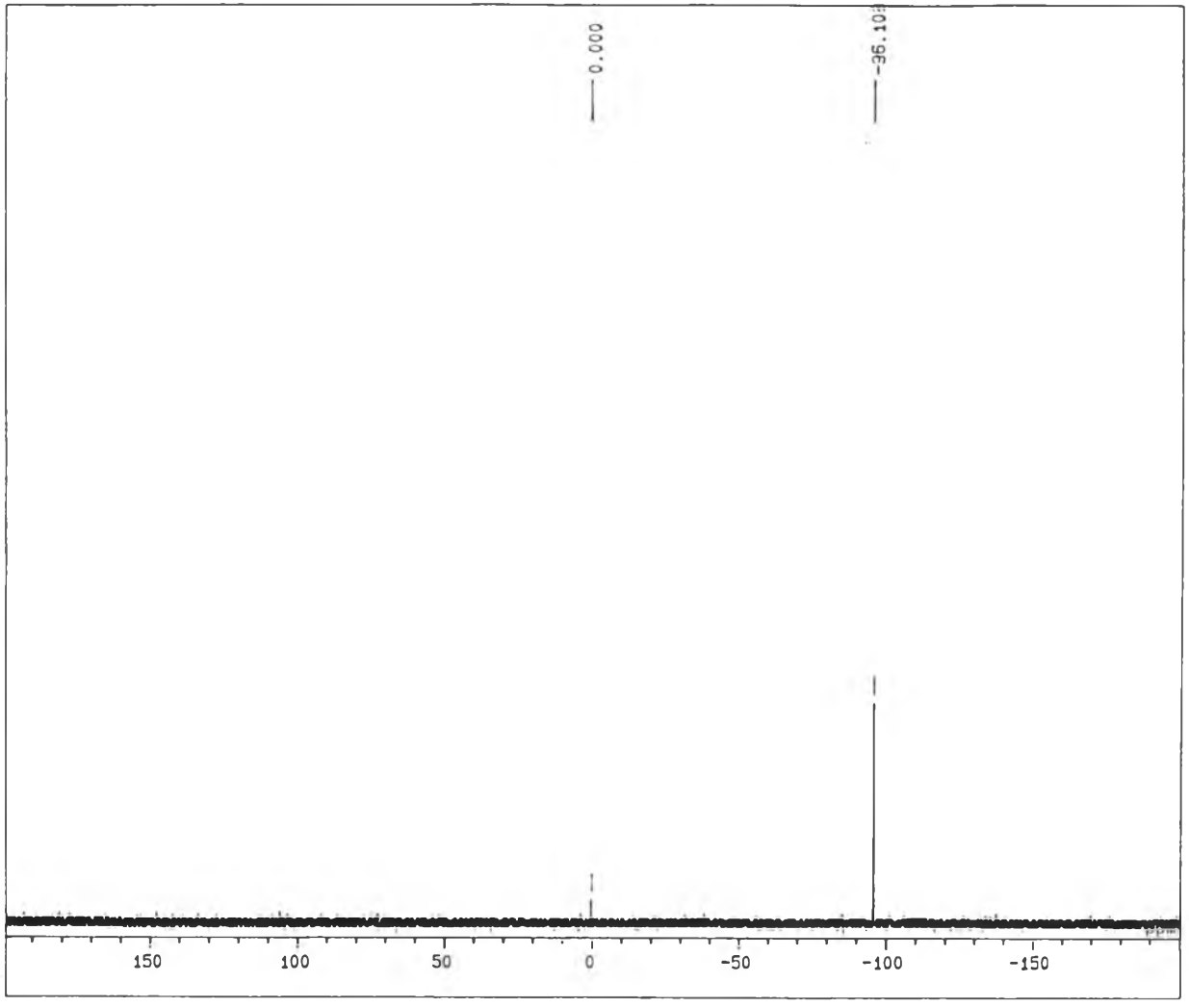
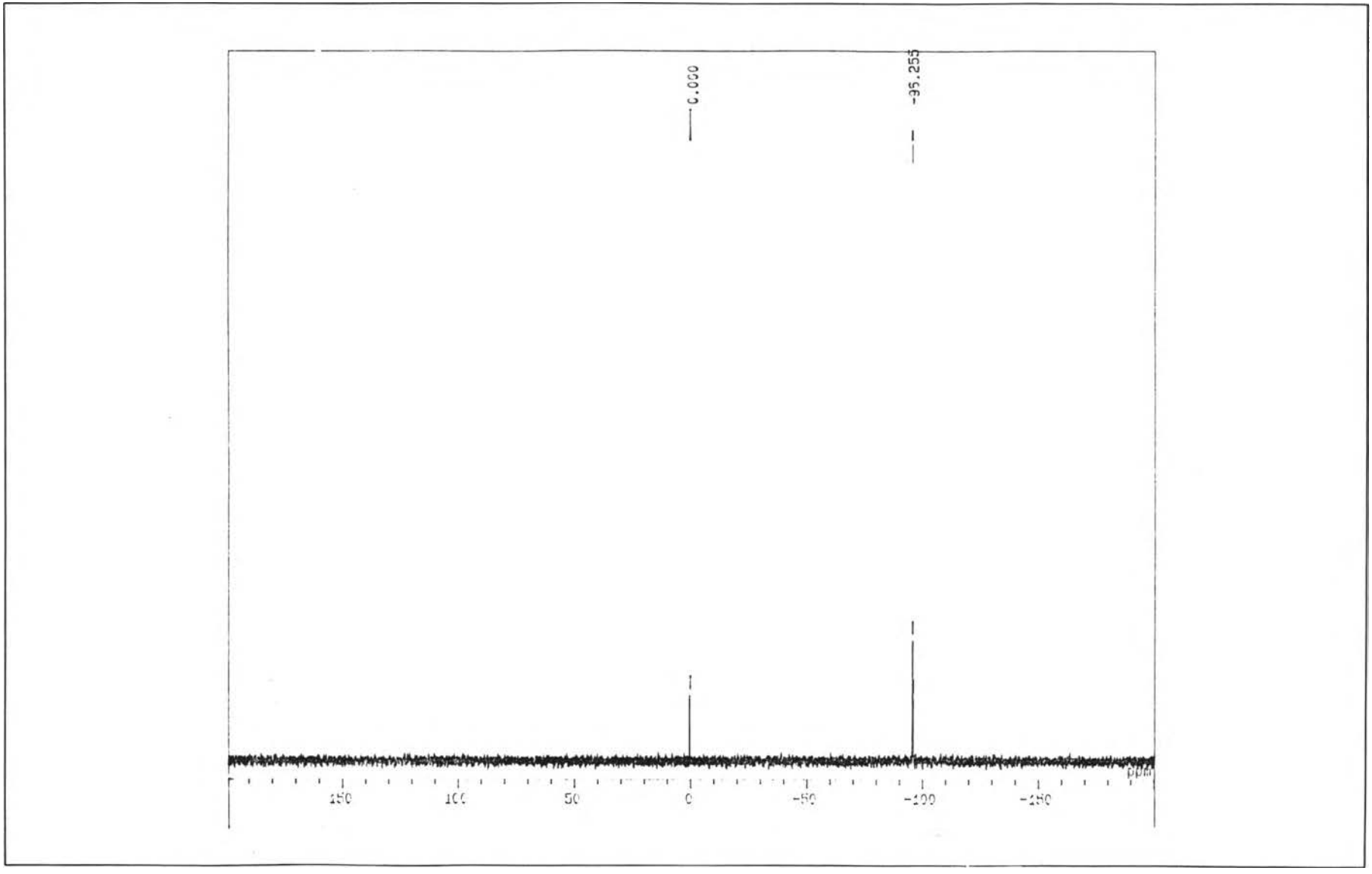


Figure A22 ^{29}Si-NMR (d_6-DMSO) Spectrum of sample 1 synthesized from silica 0.007 μm, TEA and EG.



Figrue A23 ^{29}Si-NMR (d_6-DMSO) Spectrum of sample 2 synthesized from silica 10.97μm, TEA and EG.

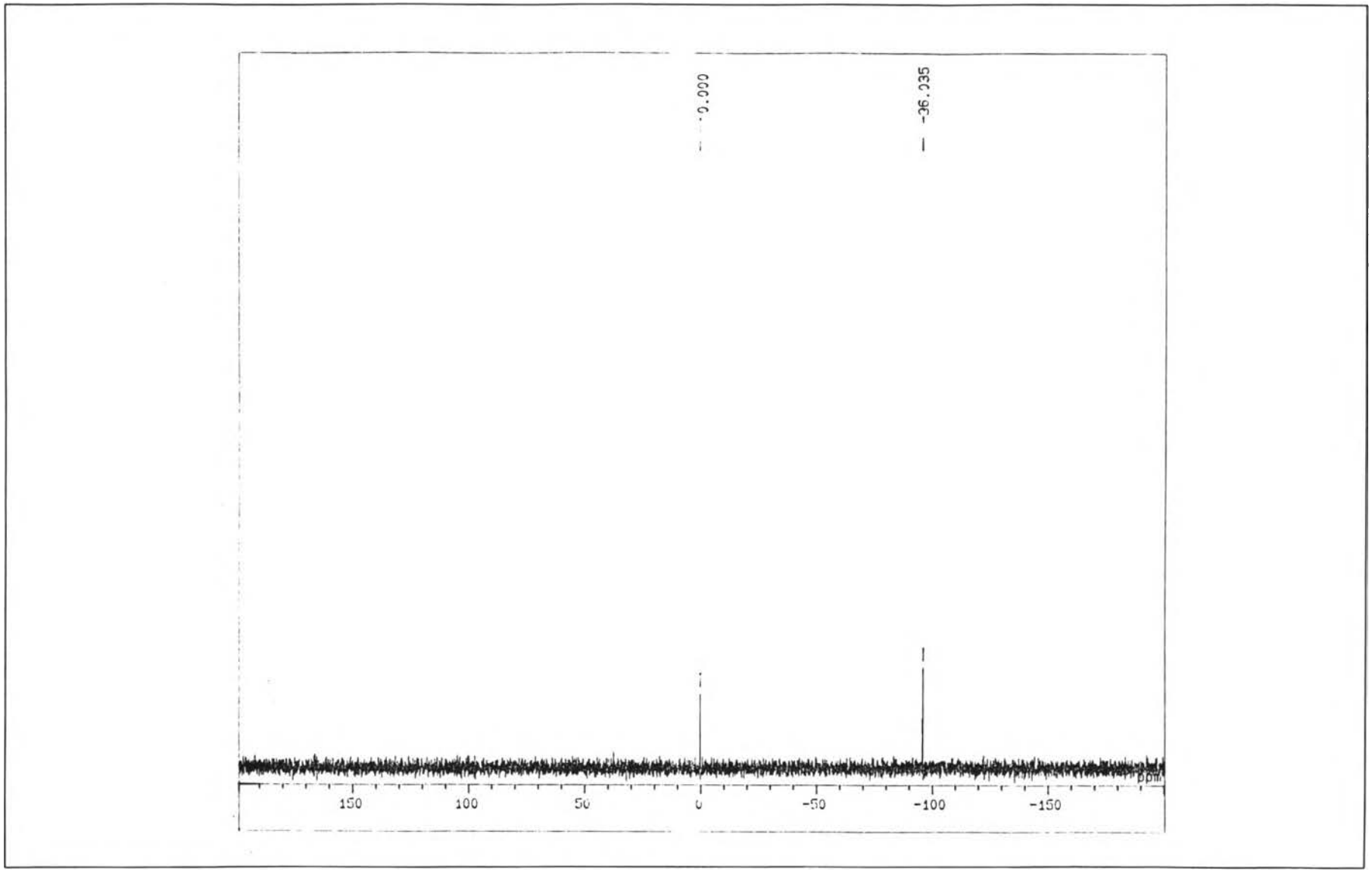


Figure A24 ^{29}Si-NMR (d_6-DMSO) Spectrum of sample 3 synthesized from rice husk ash 13.47 μm, TEA and EG.

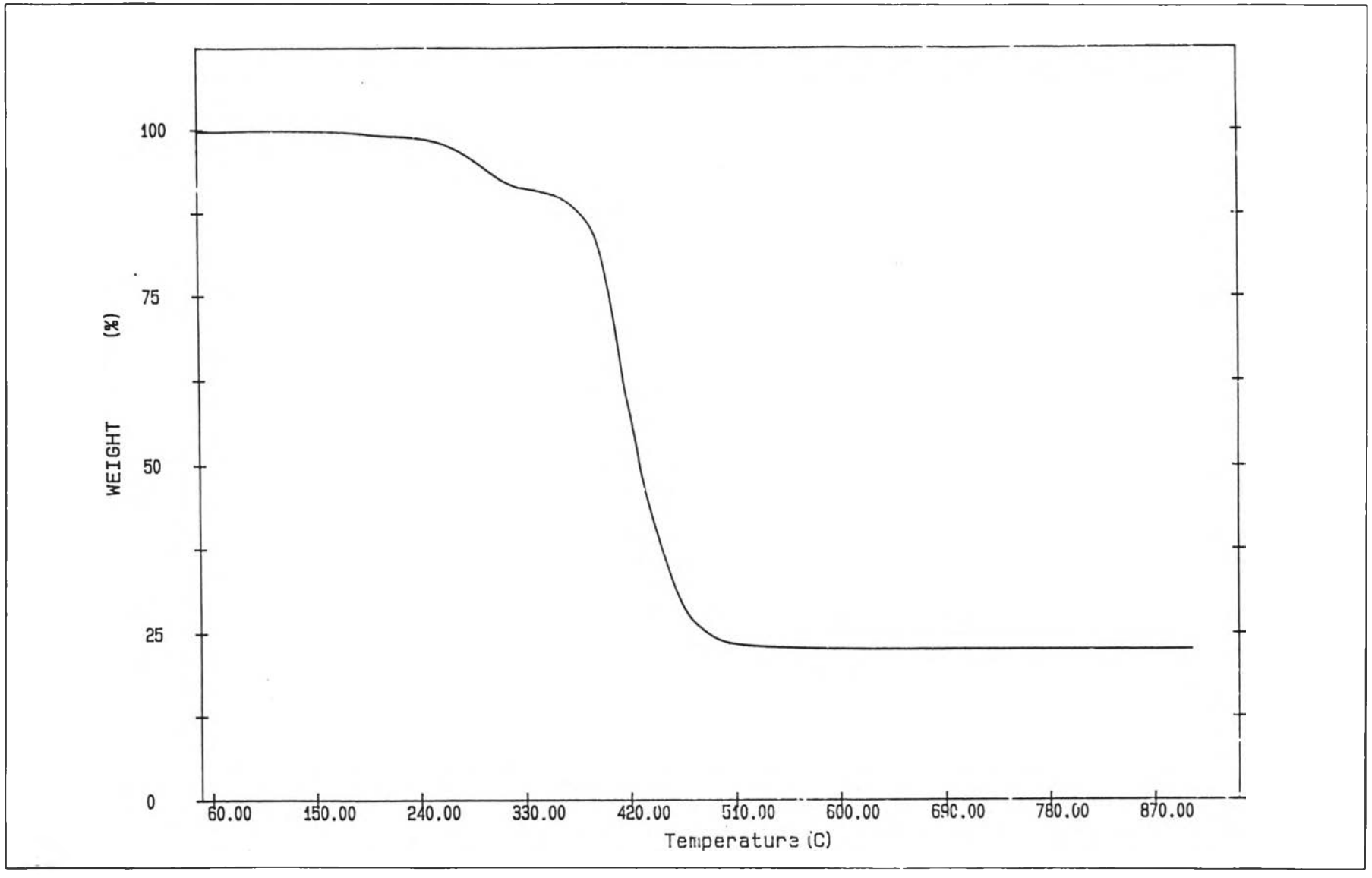


Figure A25 TGA Thermogram of sample 1 synthesized from silica 0.007 μm, TEA and EG.

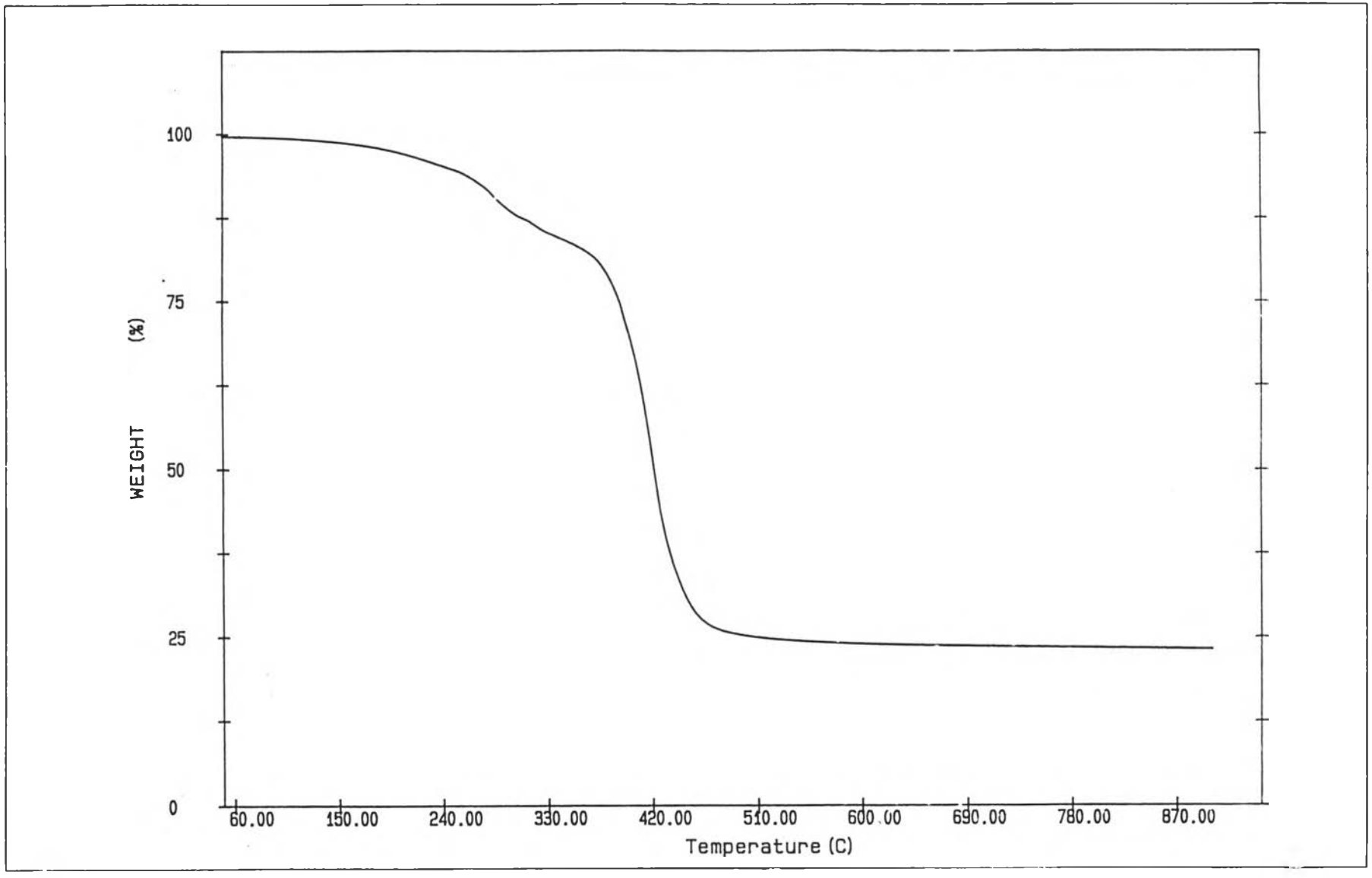


Figure A26 TGA Thermogram of sample 2 synthesized from silica 10.97 μm, TEA and EG.

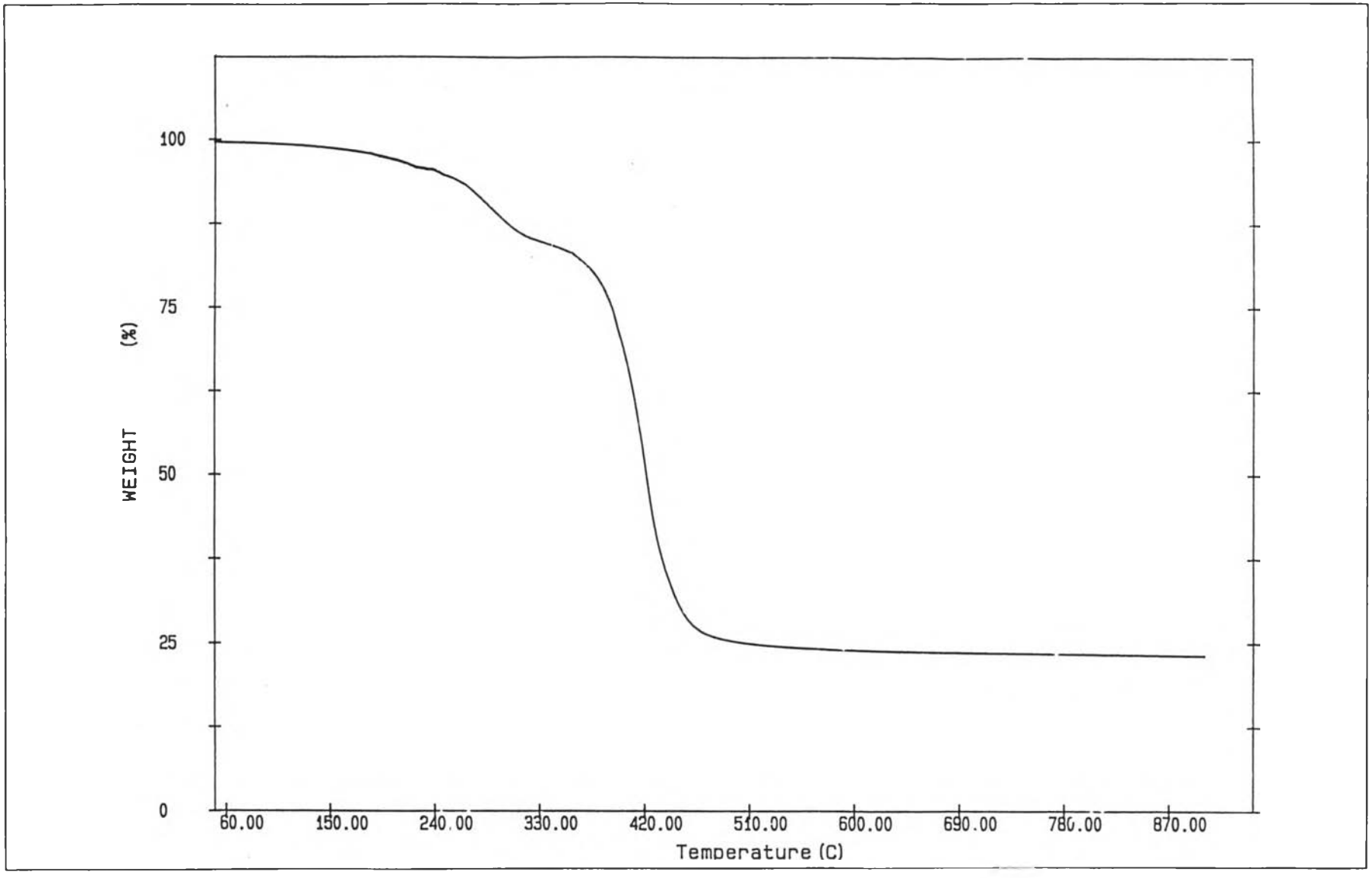


Figure A27 TGA Thermogram of sample 3 synthesized from rice husk ash 13.47 μm, TEA and EG.

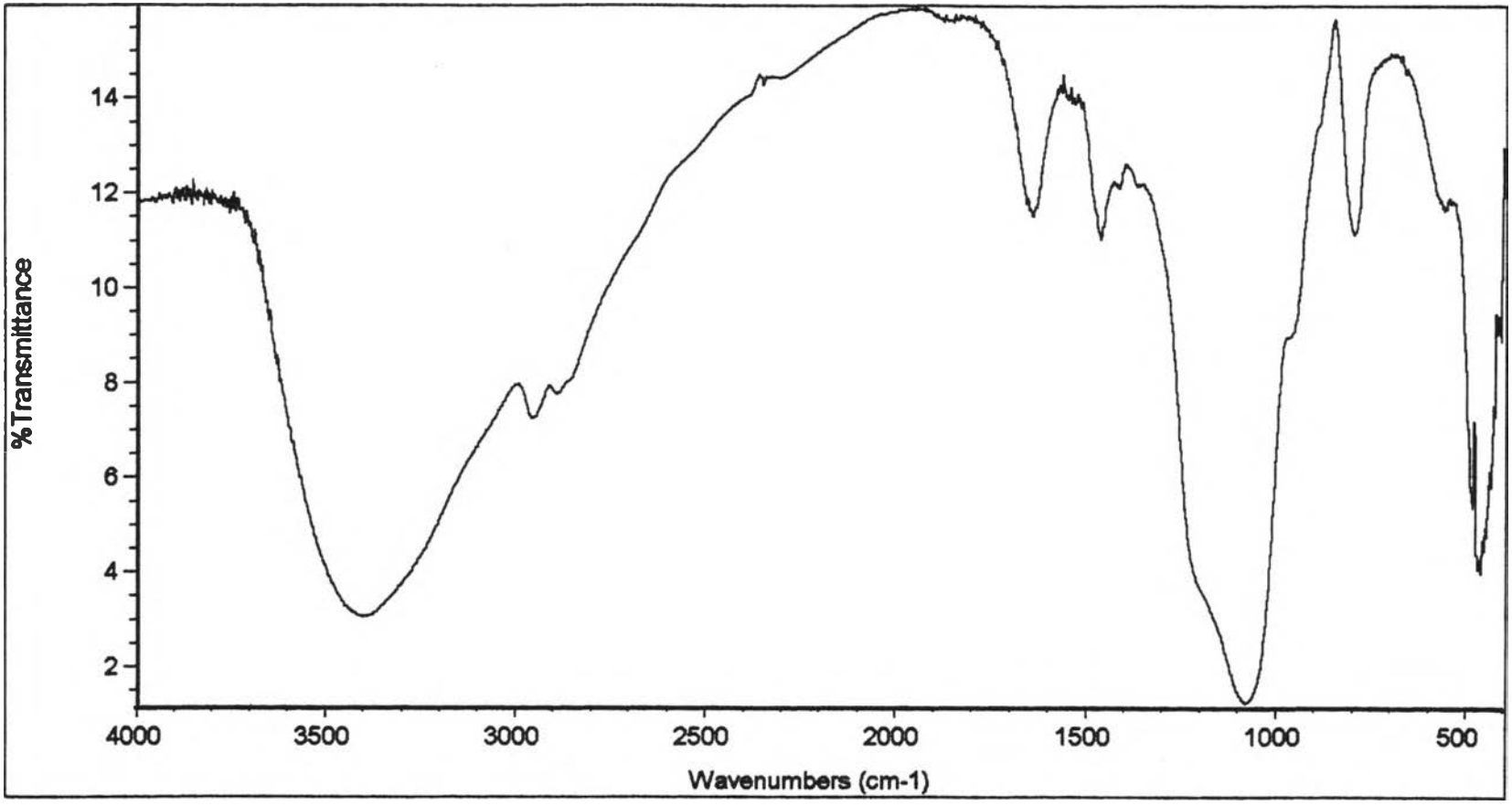


Figure A28 FT-IR Spectrum of sample 4 synthesized from silica 0.007 μm, DEA and EG.

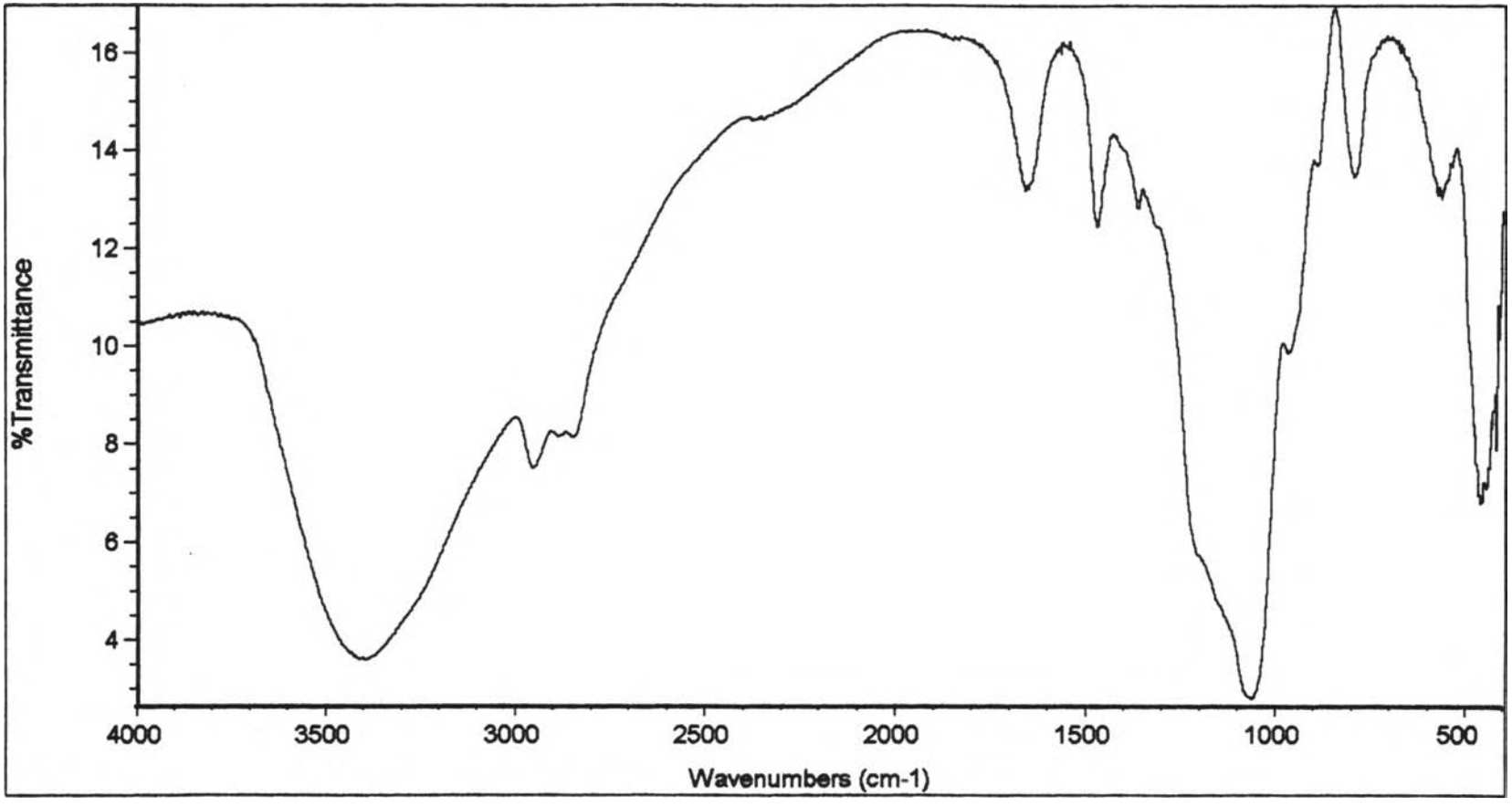


Figure A29 FT-IR Spectrum of sample 5 synthesized from silica 10.47 μm, DEA and EG.

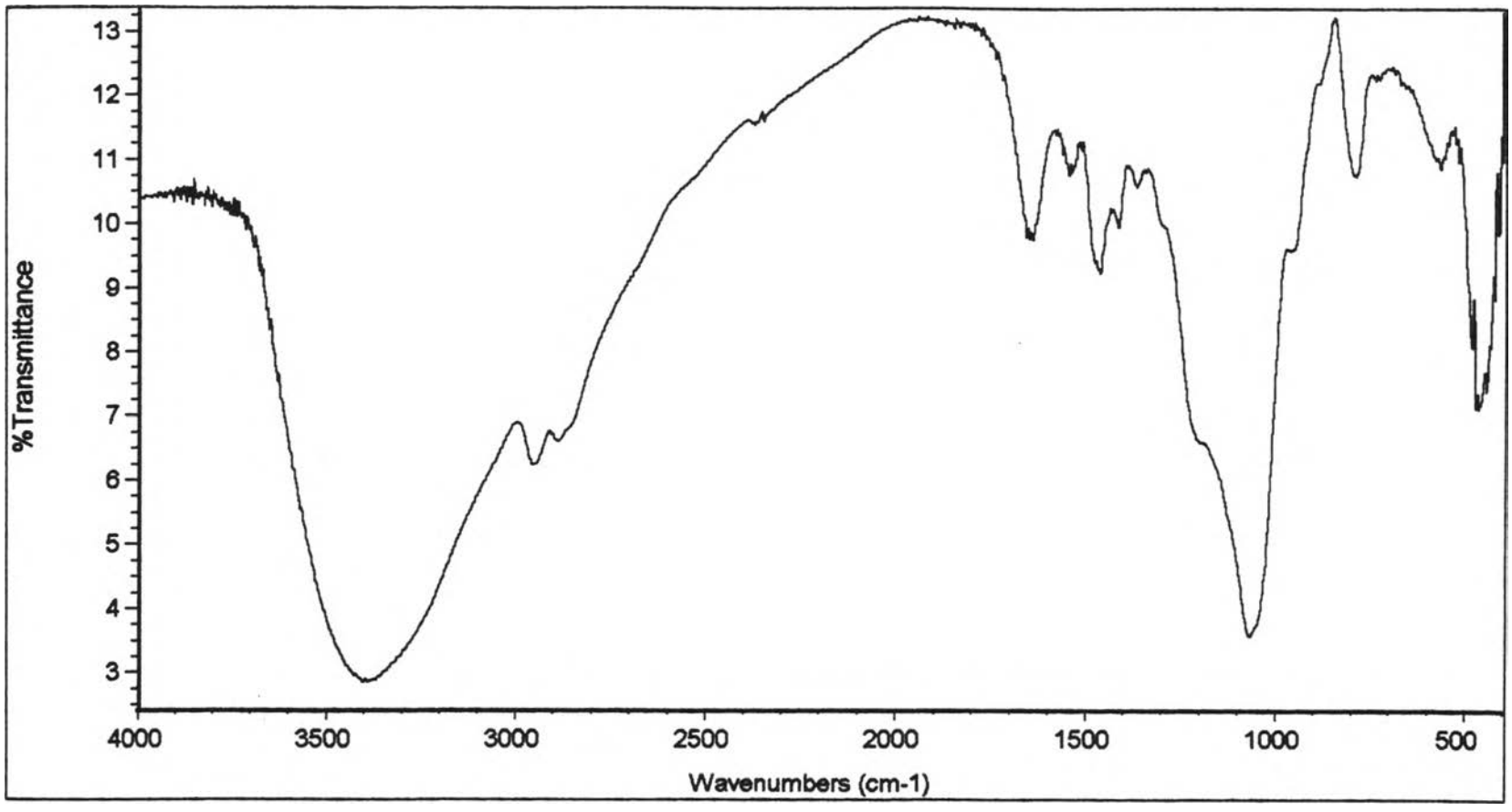


Figure A30 FT-IR Spectrum of sample 6 synthesized from rice husk ash 13.47 µm, DEA and EG.

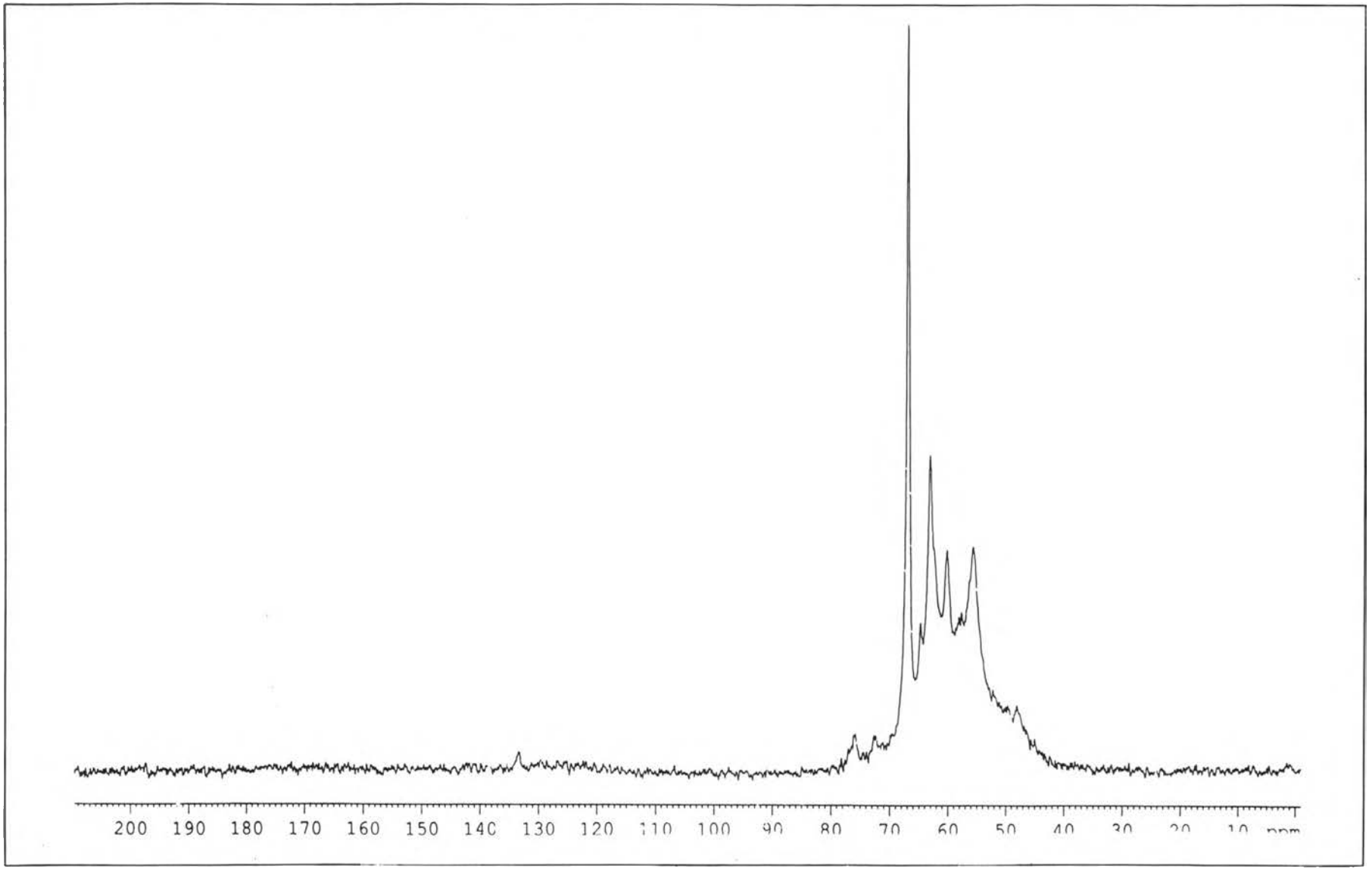


Figure A31 ^{13}C-NMR Solid State Spectrum of sample 4 synthesized from silica 0.007µm, DEA and EG.

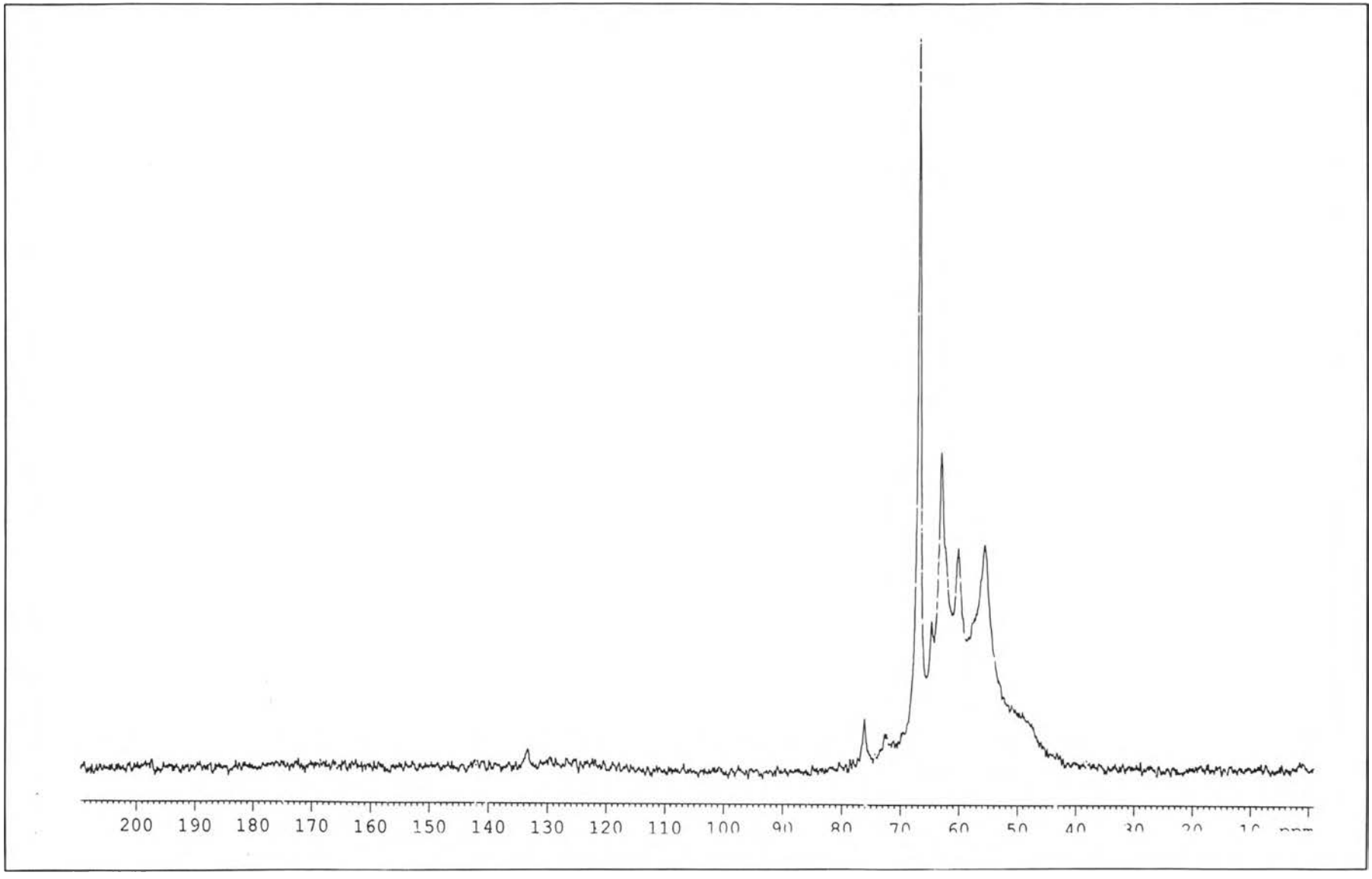


Figure A32 ^{13}C-NMR Solid State Spectrum of sample 5 synthesized from silica 10.97 μm, DEA and EG.

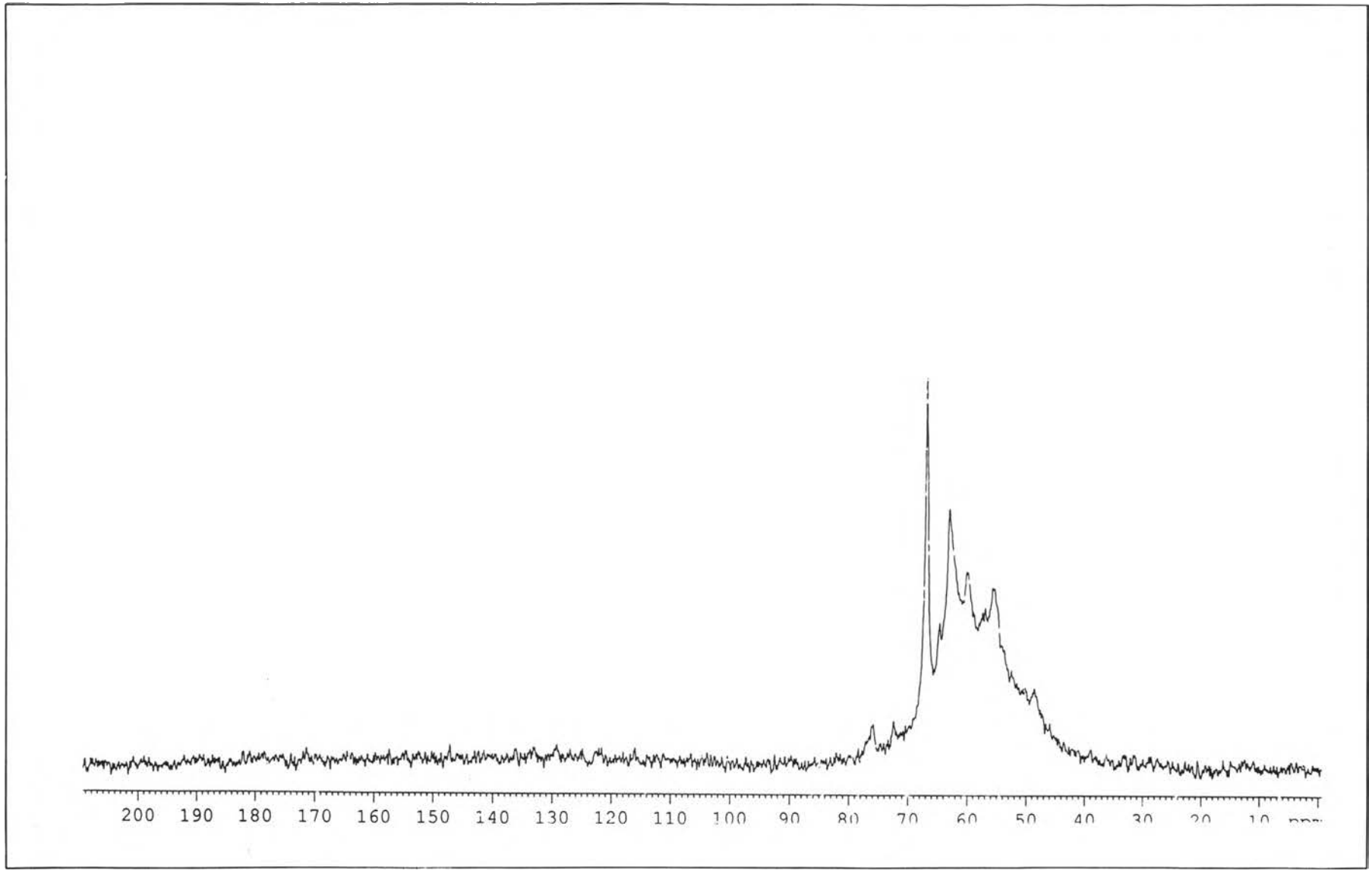


Figure A33 ^{13}C-NMR Solid State Spectrum of sample 6 synthesized from rice husk ash 13.47 µm, DEA and EG.

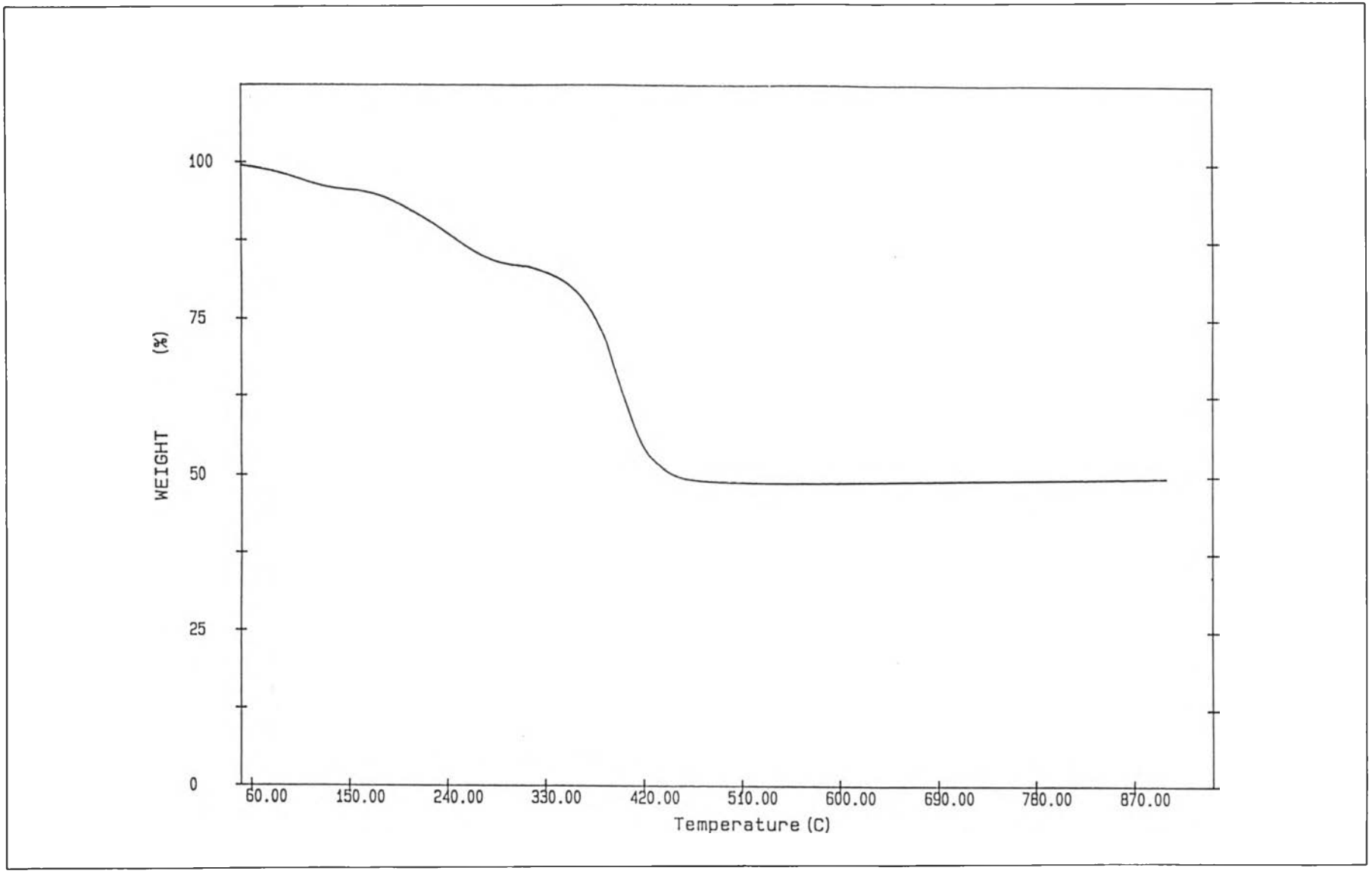


Figure A34 TGA Thermogram of sample 4 synthesized from silica 0.007 μm, DEA and EG.

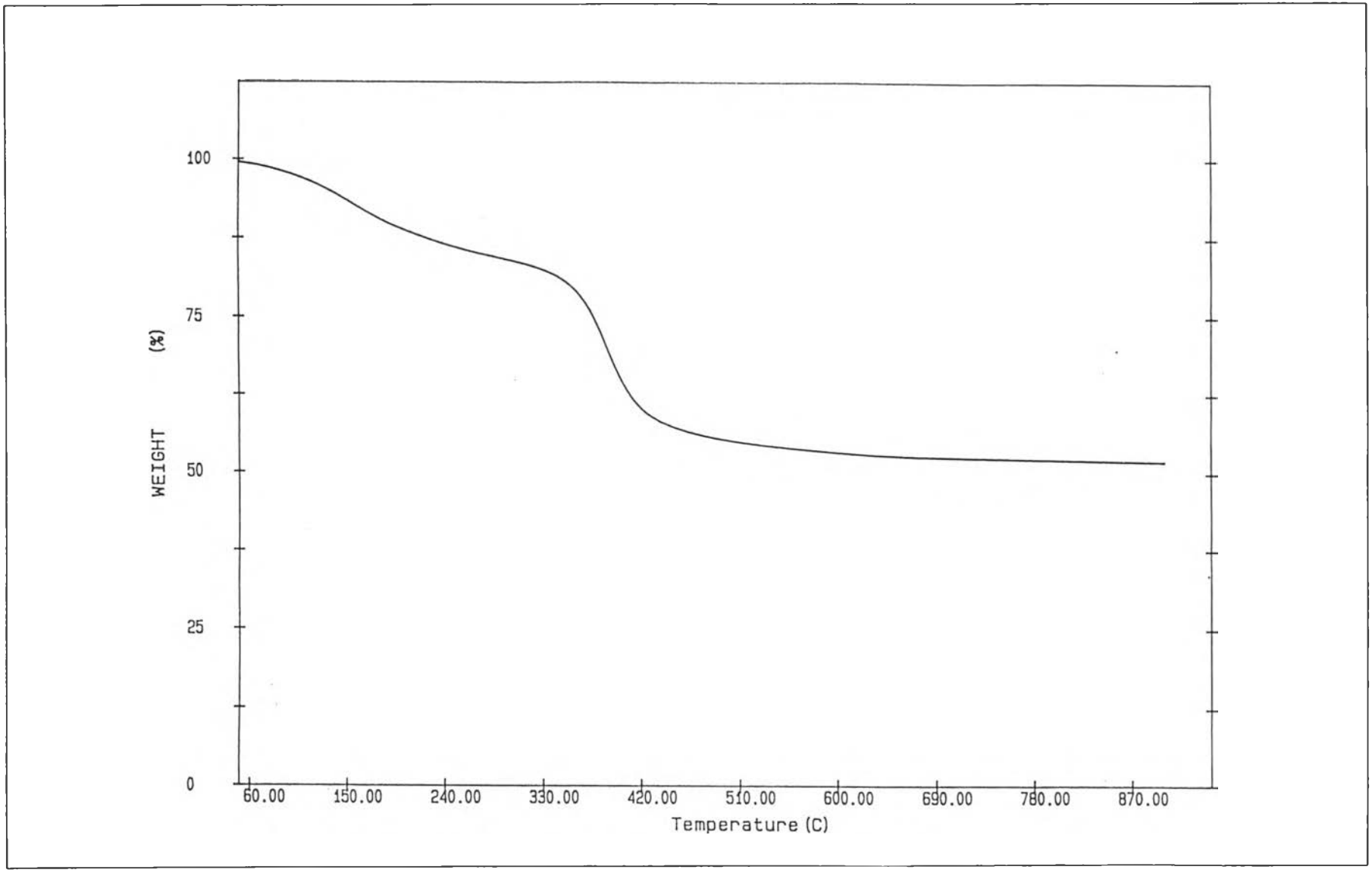


Figure A35 TGA Thermogram of sample 5 synthesized from silica 10.97 μm, DEA and EG.

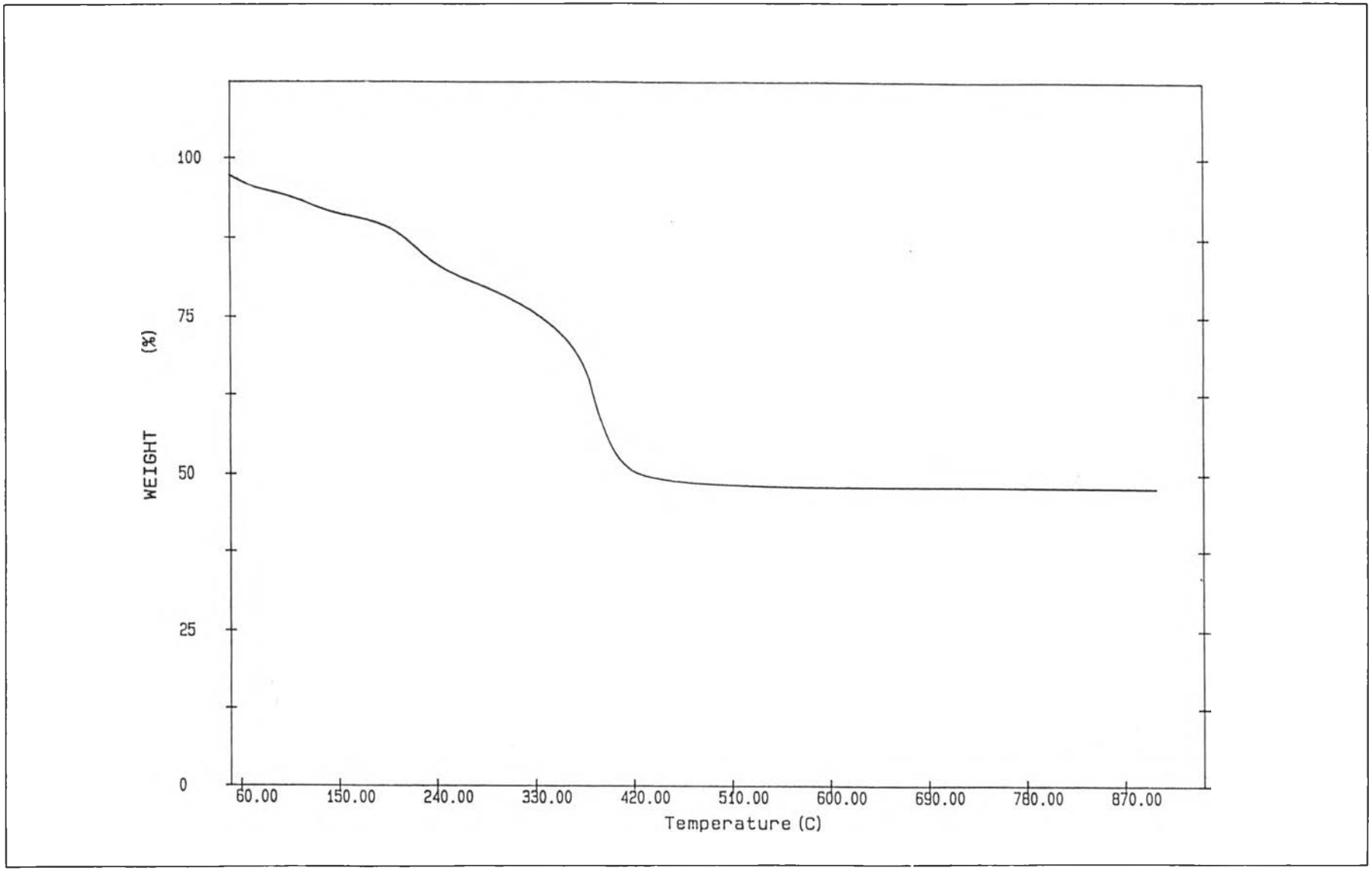


Figure A36 TGA Thermogram of sample 6 synthesized from rice husk ash 13.47 μm, DEA and EG.

VITA

Miss Pensiri Navasetthakul was born on Auguest 6, 1971 in Narathiwat, Thailand. She received the Degree of Bachelor of Science in Polymer Science from Department of Polymer Science, Faculty of Science, Prince of Songkla University in 1993. She became a student in graduate school at Multidisciplinary of Petrochemistry and Polymer, major Polymer Science, Chulalongkorn University in 1994 and she graduated with a Master's Degree of Polymer Science in 1997.