

LIST OF TABLES

<u>TABLE No.</u>	<u>TITLE</u>	<u>PAGE</u>
1.	Molar conductances, $\Lambda$ ( $\text{ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ ) and the corresponding molar concentrations, $C$ ( $\text{mol dm}^{-3}$ ) for $\text{Bu}_4\text{NBPh}_4$ in AN and in $\text{H}_2\text{O} + \text{AN}$ mixtures at $25^\circ\text{C}$ .	.. 35
2.	Molar conductances, $\Lambda$ ( $\text{ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ ) and the corresponding molar concentrations, $C$ ( $\text{mol dm}^{-3}$ ) for $\text{Bu}_4\text{NClO}_4$ in AN and in $\text{H}_2\text{O} + \text{AN}$ mixtures at $25^\circ\text{C}$ .	.. 37
3.	Molar conductances, $\Lambda$ ( $\text{ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ ) and the corresponding molar concentrations, $C$ ( $\text{mol dm}^{-3}$ ) for $\text{CuClO}_4$ in AN and in $\text{H}_2\text{O} + \text{AN}$ mixtures at $25^\circ\text{C}$ .	.. 39
4.	Dielectric constant ( $D$ ), the viscosity ( $\eta$ ), the Bjerrum critical distance ( $q$ ) and the $r_y$ parameter of the Gill equation (14) for AN and $\text{H}_2\text{O} + \text{AN}$ mixtures at $25^\circ\text{C}$ .	.. 42
5.	$\Lambda_o$ ( $\text{ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ ) and $K_A$ ( $\text{dm}^3 \text{ mol}^{-1}$ ) values for some electrolytes in AN and in $\text{H}_2\text{O} + \text{AN}$ mixtures at $25^\circ\text{C}$ derived by Shedlovsky's method	43
6.	Limiting ion conductances, $\lambda_i^\circ$ ( $\text{ohm}^{-1} \text{ cm}^2 \text{ mol}^{-1}$ ) and the actual solvated radii, $r_i^\circ$ ( $\text{\AA}$ ) for various ions in AN and in $\text{H}_2\text{O} + \text{AN}$ mixtures at $25^\circ\text{C}$ .	.. 48

7. Effect of copper sulphate concentration on the rate (R) of reaction (15) in  $H_2O + AN$  mixtures at  $25^\circ C$ . .. 60
8. Rate (R) of reaction (15) at different concentrations of  $H_2SO_4$  in  $H_2O + AN$  mixtures containing 5 and 20% AN using 0.064 and 0.32  $mol\ dm^{-3}$  copper sulphate with 4 and 8 g of copper crystals (2-30  $\mu m$ ) at  $25^\circ C$  respectively. 65
9. Rate (R) of reaction (15) with copper sulphate concentration of 0.32  $mol\ dm^{-3}$  in  $H_2O + AN$  mixtures at different temperatures. .. 67
10. Rate (R) of reaction (15) using 0.064  $mol\ dm^{-3}$  copper sulphate, 0.07  $mol\ dm^{-3}$   $H_2SO_4$  in 150  $cm^3$  of the reaction solution in  $H_2O + AN$  mixtures containing 5, 20 and 40% AN with 4 g of copper crystals of 40-180  $\mu m$ , 2-30  $\mu m$  and 200 mesh in size at  $25^\circ C$ . .. 70
11. Rate (R) of reaction (15) using 0.32  $mol\ dm^{-3}$  copper sulphate, 8 g of copper crystals (2-30  $\mu m$ ) and 20% AN in  $H_2O + AN$  mixture at 25, 35 and  $45^\circ C$  at different rates of stirring. 73
12. Initial copper(I) concentration,  $C_o$  ( $mol\ dm^{-3}$ ) and the rate (R, in  $mol\ dm^{-3}\ min^{-1}$ ) of reaction (16) in  $H_2O + AN$  mixtures of different composition at  $80 \pm 2^\circ C$ . .. 81

13. Amount of copper(I) formed (M) as a function of time in  $H_2O + AN$  mixtures containing 5, 10, 20 and 40% AN,  $0.032 \text{ mol dm}^{-3}$  copper sulphate, 1 g copper crystals ( $2-30 \mu\text{m}$ ) and  $0.07 \text{ mol dm}^{-3}$  of  $H_2SO_4$  in  $150 \text{ cm}^3$  of the reaction solution at  $25^\circ\text{C}$ . .. 104
14. Amount of copper(I) formed (M) as a function of time in  $H_2O + AN$  mixtures containing 5, 10, 20 and 40% AN,  $0.032 \text{ mol dm}^{-3}$  copper sulphate, 4 g copper crystals ( $2-30 \mu\text{m}$ ) and  $0.07 \text{ mol dm}^{-3}$  of  $H_2SO_4$  in  $150 \text{ cm}^3$  of the reaction solution at  $25^\circ\text{C}$ . .. 105
15. Amount of copper(I) formed (M) as a function of time in  $H_2O + AN$  mixtures containing 5, 10, 20 and 40% AN,  $0.032 \text{ mol dm}^{-3}$  copper sulphate, 8 g copper crystals ( $2-30 \mu\text{m}$ ) and  $0.07 \text{ mol dm}^{-3}$  of  $H_2SO_4$  in  $150 \text{ cm}^3$  of the reaction solution at  $25^\circ\text{C}$ . .. 106
16. Amount of copper(I) formed (M) as a function of time in  $H_2O + AN$  mixtures containing 5, 10, 20 and 40% AN,  $0.064 \text{ mol dm}^{-3}$  copper sulphate, 1 g copper crystals ( $2-30 \mu\text{m}$ ) and  $0.07 \text{ mol dm}^{-3}$  of  $H_2SO_4$  in  $150 \text{ cm}^3$  of the reaction solution at  $25^\circ\text{C}$ . .. 107

17. Amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 5, 10, 20 and 40% AN, 0.064 mol dm<sup>-3</sup> copper sulphate, 4 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 25°C. .. 108
18. Amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 5, 10, 20 and 40% AN, 0.064 mol dm<sup>-3</sup> copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 25°C. .. 109
19. Amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 5, 10 and 20% AN, 0.16 mol dm<sup>-3</sup> copper sulphate, 1 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 25°C. .. 110
20. Amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 5, 10 and 20% AN, 0.16 mol dm<sup>-3</sup> copper sulphate, 4 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 25°C. .. 111

21. Amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 5, 10 and 20% AN, 0.16 mol dm<sup>-3</sup> copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 25°C. .. 112
22. Amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm<sup>-3</sup> copper sulphate, 1 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 25°C. .. 113
23. Amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm<sup>-3</sup> copper sulphate, 4 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 25°C. .. 114
24. Amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm<sup>-3</sup> copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 25°C. .. 115

25. Effect of  $H_2SO_4$  on the amount of copper(I) formed (M) as a function of time in  $H_2O + AN$  mixtures containing 5% AN,  $0.064 \text{ mol dm}^{-3}$  copper sulphate and 4 g copper crystals ( $2-30 \mu\text{m}$ ) in  $150 \text{ cm}^3$  of the reaction solution at  $25^\circ\text{C}$ . .. 116
26. Effect of  $H_2SO_4$  on the amount of copper(I) formed (M) as a function of time in  $H_2O + AN$  mixtures containing 20% AN,  $0.32 \text{ mol dm}^{-3}$  copper sulphate and 8 g copper crystals ( $2-30 \mu\text{m}$ ) in  $150 \text{ cm}^3$  of the reaction solution at  $25^\circ\text{C}$ . .. 117
27. Amount of copper(I) formed (M) as a function of time in  $H_2O + AN$  mixtures containing 5, 10 and 20% AN,  $0.32 \text{ mol dm}^{-3}$  copper sulphate, 1 g copper crystals ( $2-30 \mu\text{m}$ ) and  $0.07 \text{ mol dm}^{-3}$  of  $H_2SO_4$  in  $150 \text{ cm}^3$  of the reaction solution at  $35^\circ\text{C}$ . .. 118
28. Amount of copper(I) formed (M) as a function of time in  $H_2O + AN$  mixtures containing 5, 10 and 20% AN,  $0.32 \text{ mol dm}^{-3}$  copper sulphate, 4 g copper crystals ( $2-30 \mu\text{m}$ ) and  $0.07 \text{ mol dm}^{-3}$  of  $H_2SO_4$  in  $150 \text{ cm}^3$  of the reaction solution at  $35^\circ\text{C}$ . .. 119

29. Amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm<sup>-3</sup> copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 35°C. .. 120
30. Amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm<sup>-3</sup> copper sulphate, 1 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 45°C. .. 121
31. Amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm<sup>-3</sup> copper sulphate, 4 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 45°C. .. 122
32. Amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm<sup>-3</sup> copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 45°C. .. 123

33. Amount of copper(I) formed (M) as a function of time in  $H_2O + AN$  mixtures containing 5, 10 and 20% AN,  $0.32 \text{ mol dm}^{-3}$  copper sulphate, 1 g copper crystals ( $2-30 \mu\text{m}$ ) and  $0.07 \text{ mol dm}^{-3}$  of  $H_2SO_4$  in  $150 \text{ cm}^3$  of the reaction solution at  $55^\circ\text{C}$ . .. 124
34. Amount of copper(I) formed (M) as a function of time in  $H_2O + AN$  mixtures containing 5, 10 and 20% AN,  $0.32 \text{ mol dm}^{-3}$  copper sulphate, 4 g copper crystals ( $2-30 \mu\text{m}$ ) and  $0.07 \text{ mol dm}^{-3}$  of  $H_2SO_4$  in  $150 \text{ cm}^3$  of the reaction solution at  $55^\circ\text{C}$ . .. 125
35. Amount of copper(I) formed (M) as a function of time in  $H_2O + AN$  mixtures containing 5, 10 and 20% AN,  $0.32 \text{ mol dm}^{-3}$  copper sulphate, 8 g copper crystals ( $2-30 \mu\text{m}$ ) and  $0.07 \text{ mol dm}^{-3}$  of  $H_2SO_4$  in  $150 \text{ cm}^3$  of the reaction solution at  $55^\circ\text{C}$ . .. 126
36. Amount of copper(I) formed (M) as a function of time in  $H_2O + AN$  mixtures containing 5, 10 and 20% AN,  $0.32 \text{ mol dm}^{-3}$  copper sulphate, 1 g copper crystals ( $2-30 \mu\text{m}$ ) and  $0.07 \text{ mol dm}^{-3}$  of  $H_2SO_4$  in  $150 \text{ cm}^3$  of the reaction solution at  $65^\circ\text{C}$ . .. 127



37. Amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm<sup>-3</sup> copper sulphate, 4 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 65°C. .. 128
38. Amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 5, 10 and 20% AN, 0.32 mol dm<sup>-3</sup> copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 65°C. .. 129
39. Effect of the surface area of the copper crystals on the amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 20% AN, 0.32 mol dm<sup>-3</sup> copper sulphate and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 25°C (stirring speed 1200 r.p.m.). .. 130
40. Effect of the stirring speed on the amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 20% AN, 0.32 mol dm<sup>-3</sup> copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 25°C. .. 131

41. Effect of the stirring speed on the amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 20% AN, 0.32 mol dm<sup>-3</sup> copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 35°C. .. 132
42. Effect of the stirring speed on the amount of copper(I) formed (M) as a function of time in H<sub>2</sub>O + AN mixtures containing 20% AN, 0.32 mol dm<sup>-3</sup> copper sulphate, 8 g copper crystals (2-30 μm) and 0.07 mol dm<sup>-3</sup> of H<sub>2</sub>SO<sub>4</sub> in 150 cm<sup>3</sup> of the reaction solution at 45°C. .. 133
43. Change of copper(I) concentration as a function of time in H<sub>2</sub>O + AN mixture containing 10% AN at 80 ± 2°C. .. 134
44. Change of copper(I) concentration as a function of time in H<sub>2</sub>O + AN mixture containing 20% AN at 80 ± 2°C. .. 135
45. Change of copper(I) concentration as a function of time in H<sub>2</sub>O + AN mixture containing 30% AN at 80 ± 2°C. .. 136
46. Change of copper(I) concentration as a function of time in H<sub>2</sub>O + AN mixture containing 40% AN at 80 ± 2°C. .. 137

47. Change of copper(I) concentration as a function of time in  $H_2O + AN$  mixtures containing 50 and 60% AN at  $80 \pm 2^\circ C$ . .. 138