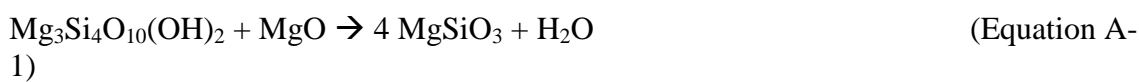
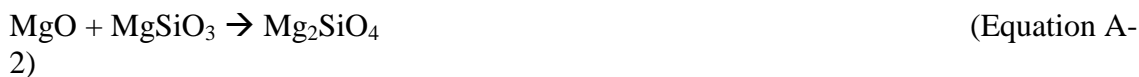


## APPENDIX A-CHEMICAL CALCULATIONS

Chemical equation for forming 50g forsterite powder

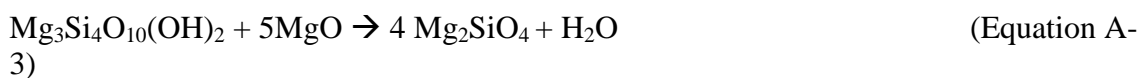


Talc



Forsterite

From (Equation A-1) and (Equation A-2)



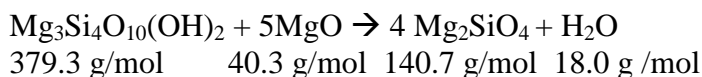
Talc

Forsterite

Table A-1: Molecular Weight (g/mol) for each element:

Element	Molecular Weight (g/mol)
Mg	24.3
O	16.0
Si	28.1
H	1.0

From (Equation A-3)



To produce 50g forsterite powder, 4 mol of forsterite produce 1 mol of talc and 5 mol of MgO.

Therefore,

$$\text{Number of mol for forsterite} = \frac{50 \text{ g}}{140.7 \text{ g/mol}} = 0.3554 \text{ mol}$$

$$\text{Number of mol for talc} = \frac{0.3554 \text{ mol}}{4} = 0.0889 \text{ mol}$$

$$\text{Mass needed for talc} = 0.0889 \text{ mol} \times 379.3 \text{ g/mol} = \underline{33.720 \text{ g}}$$

$$\text{Number of mol for MgO} = 0.3554 \text{ mol} \times \frac{5}{4} = 0.4443 \text{ mol}$$

$$\text{Mass needed for MgO} = 0.4443 \text{ mol} \times 40.3 \text{ g/mol} = \underline{17.9053 \text{ g}}$$

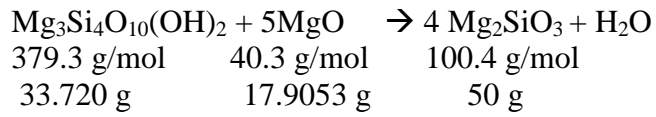
$$\text{Weight percentage of talc} = \frac{33.720}{33.720+17.9053} \times 100 \% = 65.3168 \%$$

$$\text{Weight percentage of MgO} = \frac{17.9053}{33.720+17.9053} \times 100 \% = 34.6832 \%$$

$$\text{Ratio of MgO/Talc} = \frac{34.6832 \%}{65.3168 \%} \times 100 \% = 0.5310$$

$$\text{Ratio of Talc/MgO} = \underline{\underline{1:1.8832}}$$

In conclusion:



## APPENDIX B – JCPDS FILES

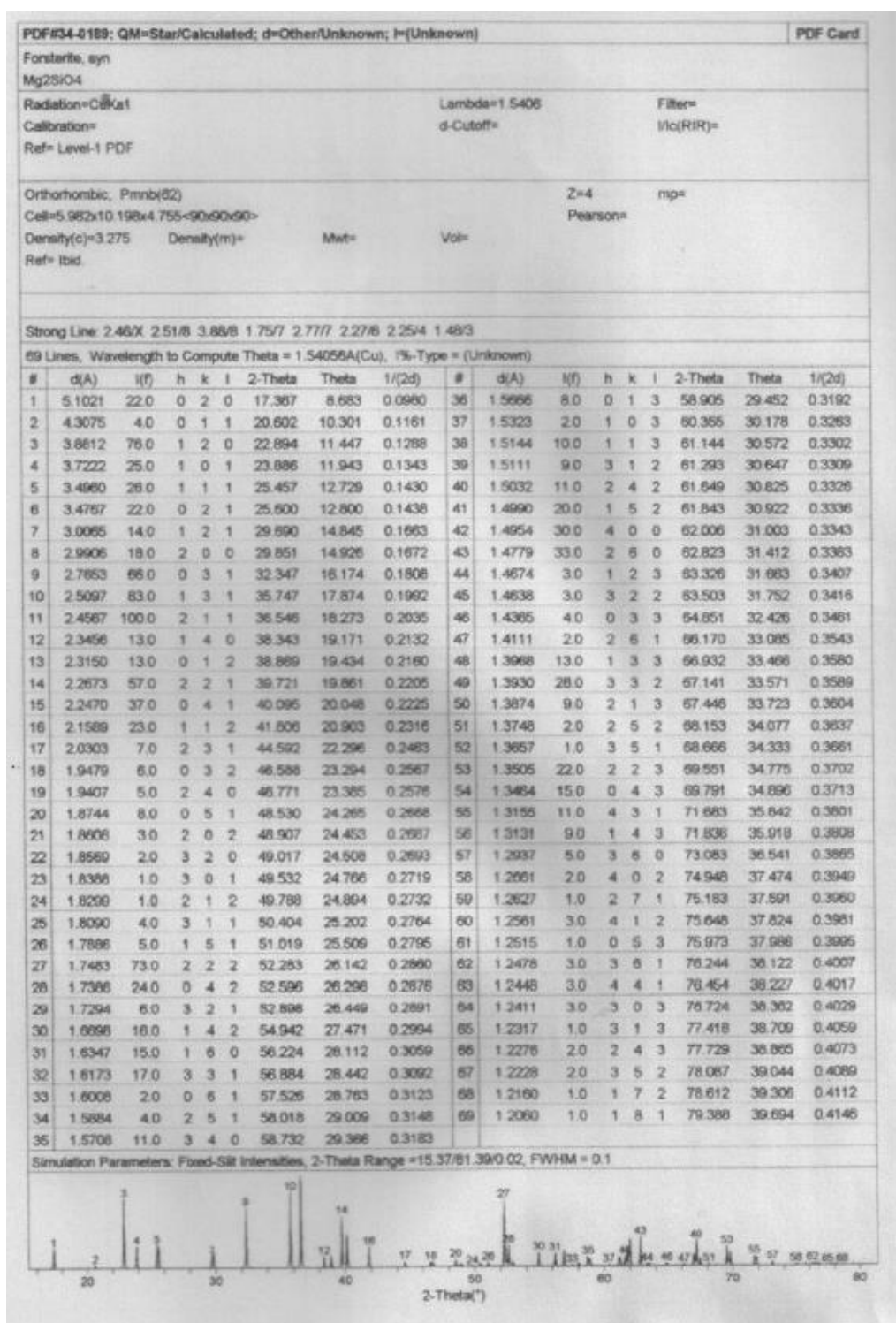


Figure B-1: JCPDS for forsterite

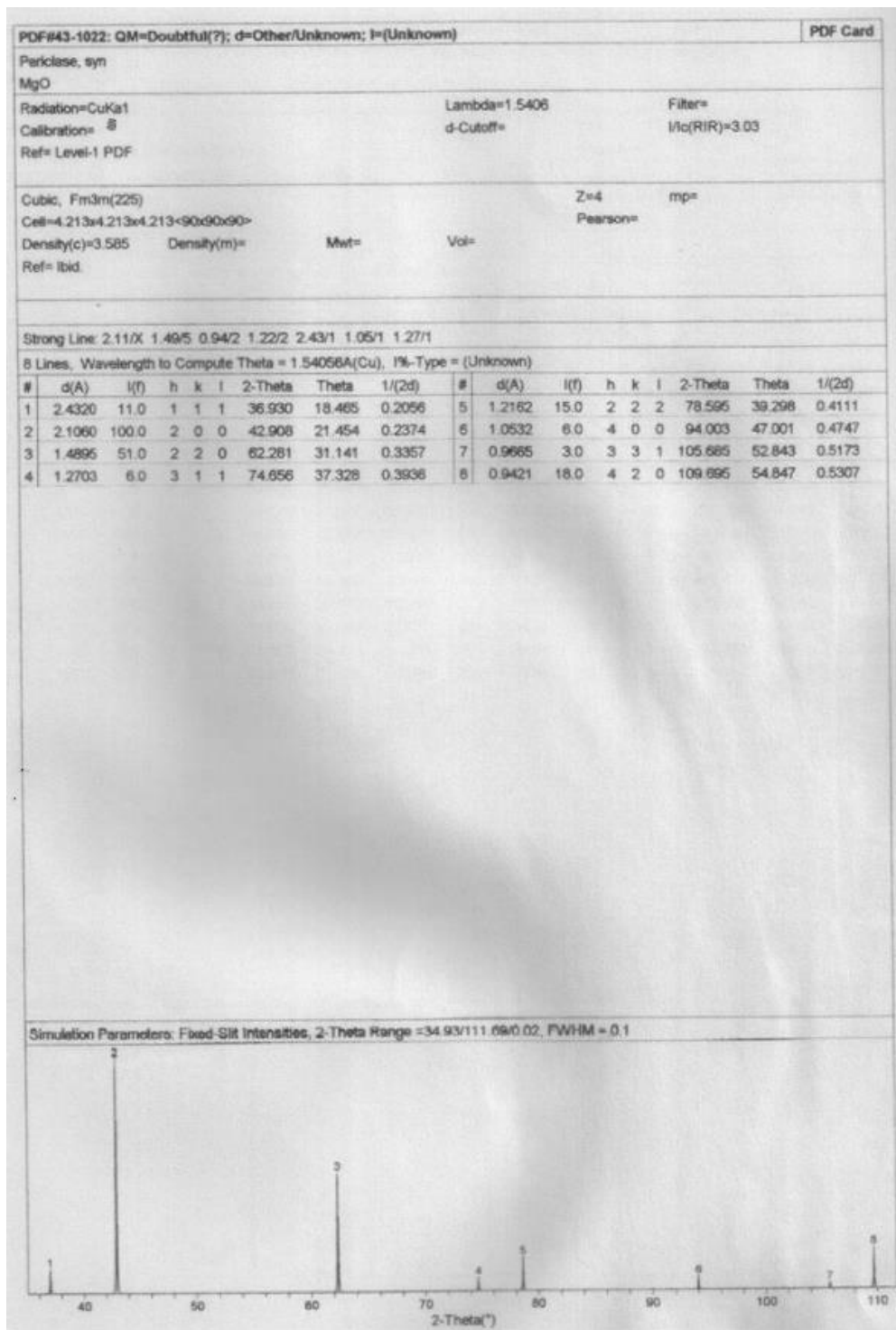


Figure B-2: JCPDS for magnesium oxide

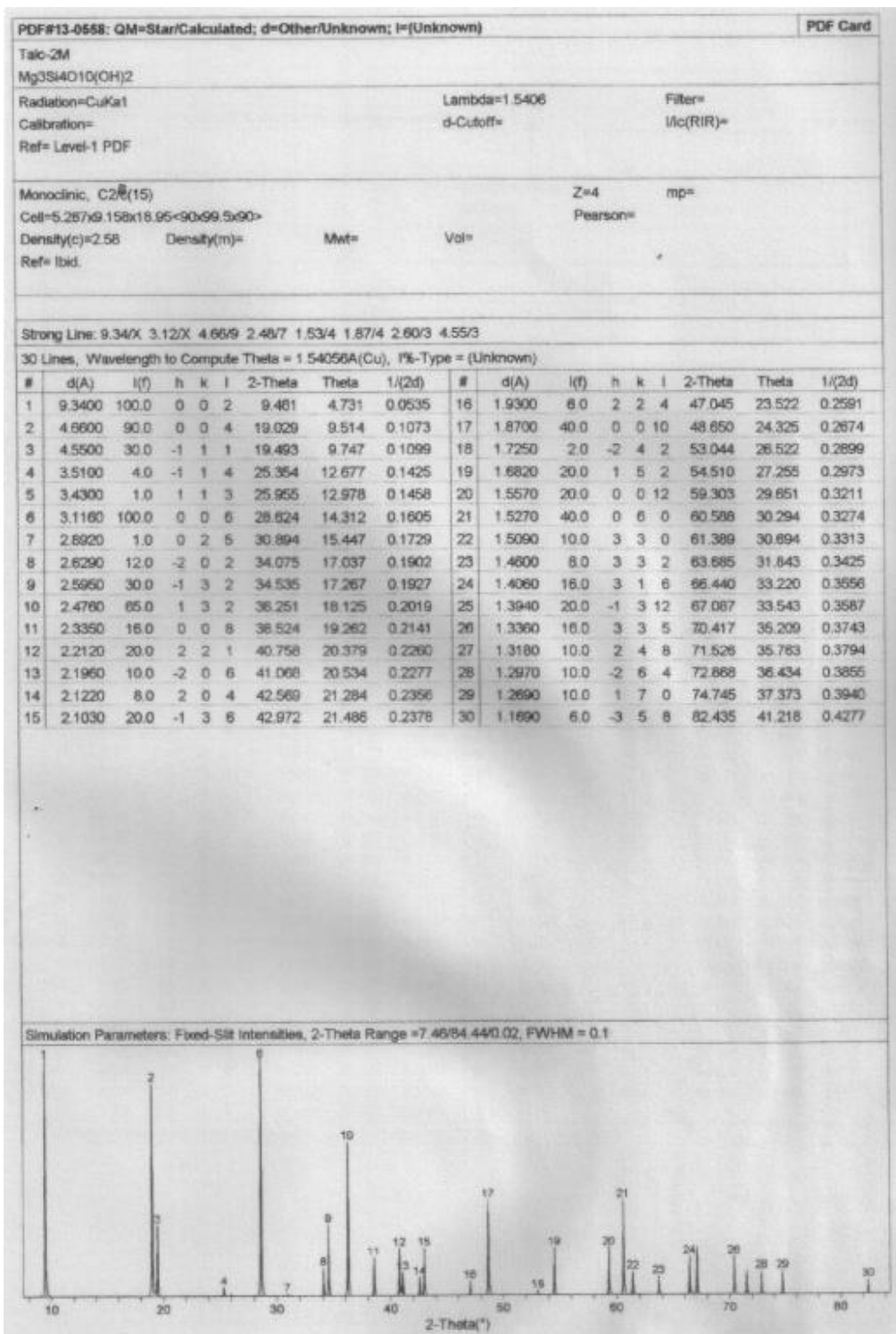


Figure B-3: JCPDS for talc,

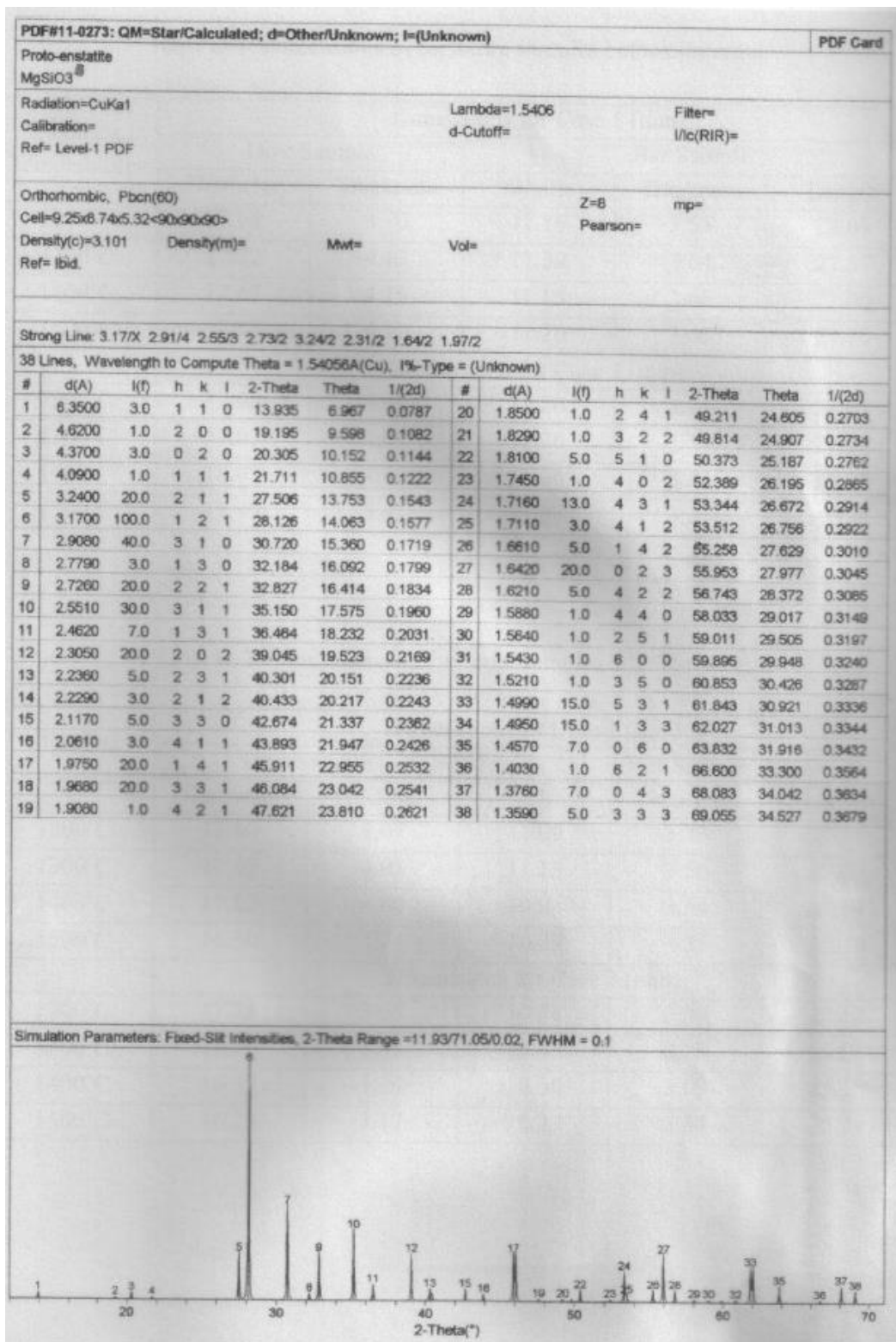


Figure B-4: JCPDS for proto enstatite

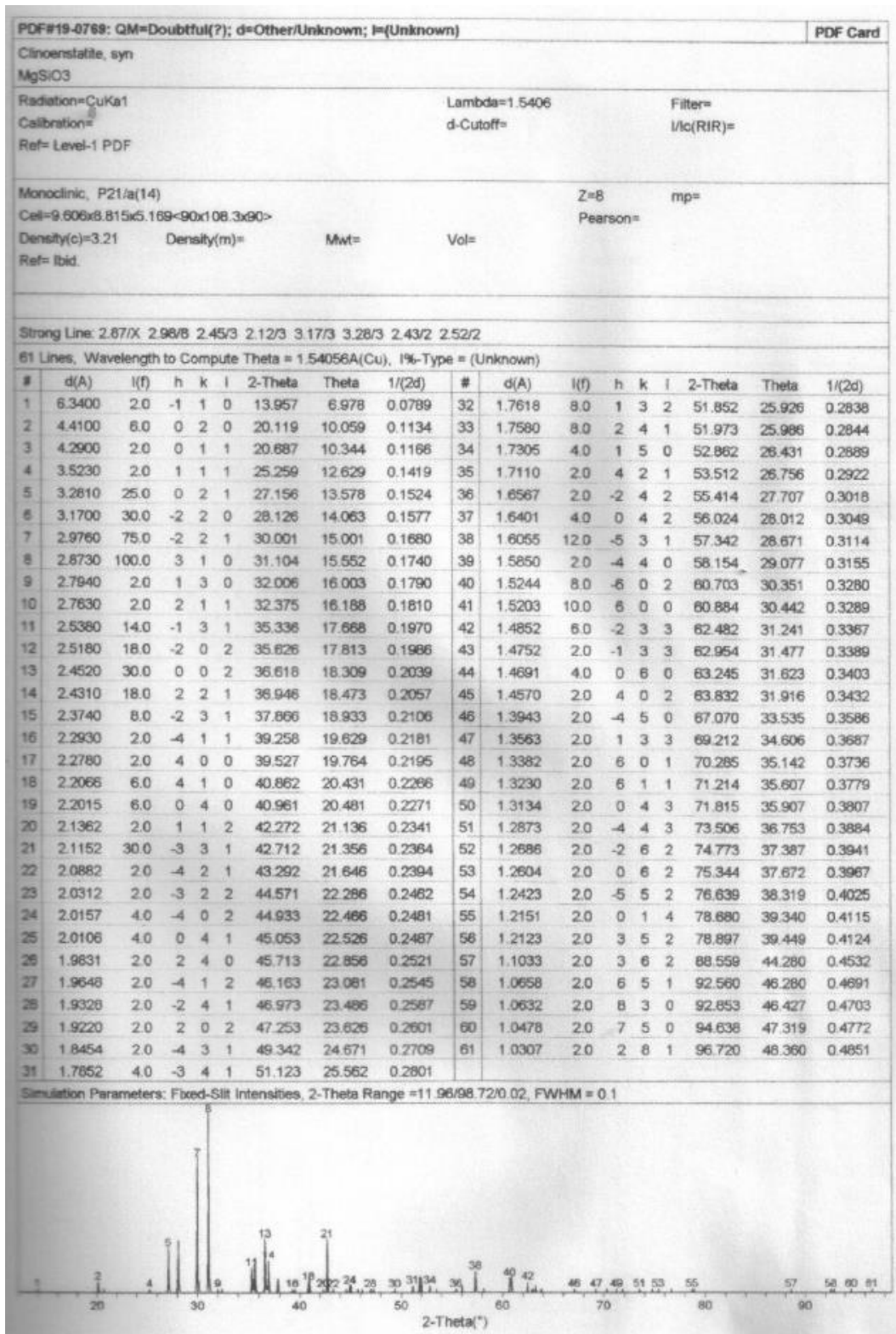
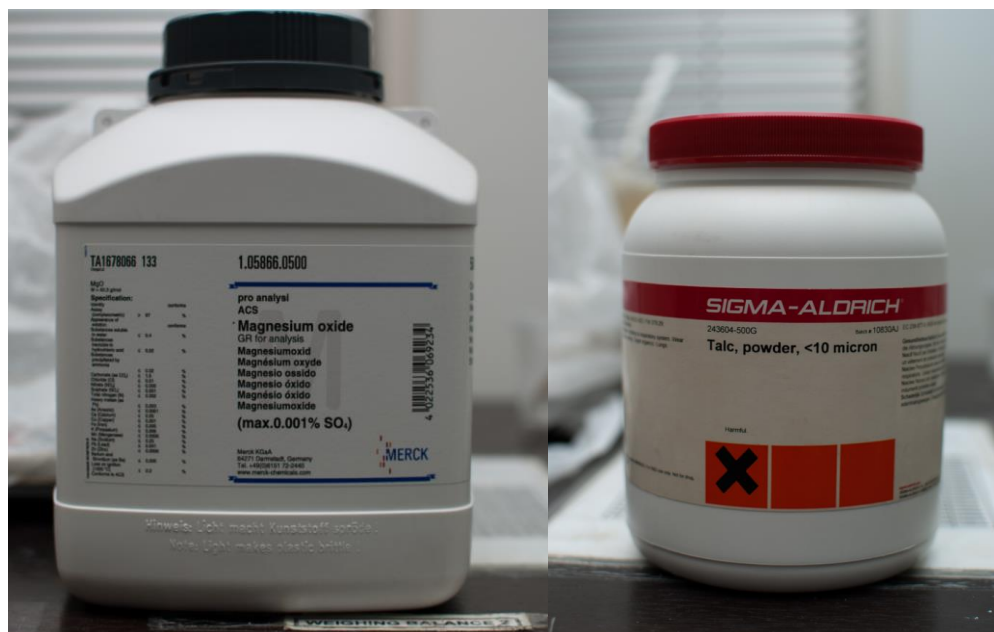


Figure B-5: JCPDS for clinoenstatite

## APPENDIX C: INSTRUMENTATIONS



(a)

(b)

Figure C-1: (a) Magnesium oxide powder, (b) talc powder



Figure C-2: AG204 Metler Toledo Balance, Switzerland





Figure C3: Shimadzu AY220 Densi-Meter Balance

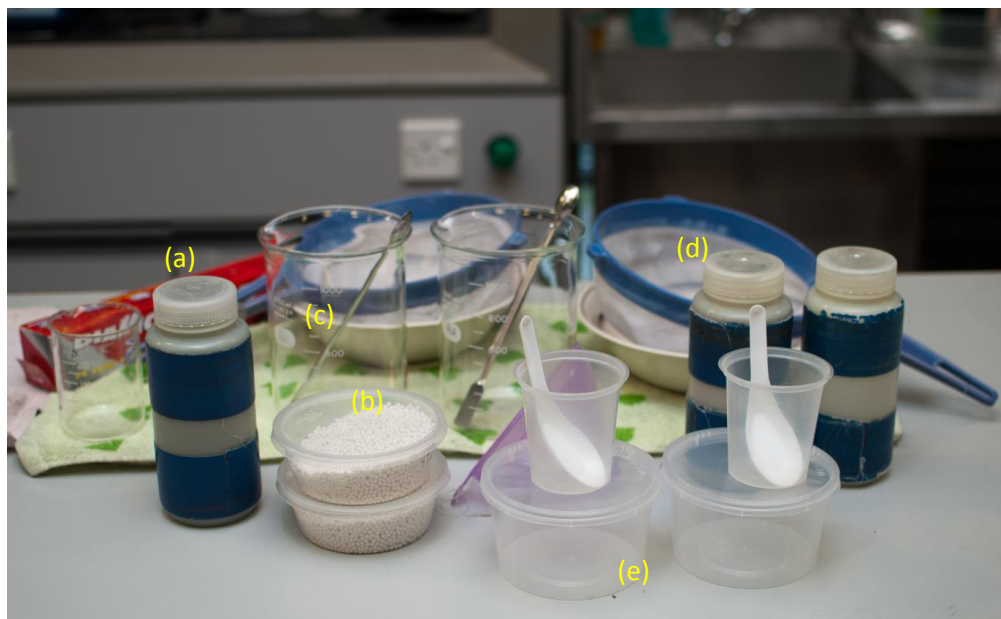


Figure C-4: (a) Ball milling bottle, (b) Ball milling media, (c) Beaker & spatula, (d) Plastic sieve, (e) Plastic container & spoon



Figure C-5: Liarre ultrasonic bath machine



Figure C-6: Cole-Palmer ultrasonic processor

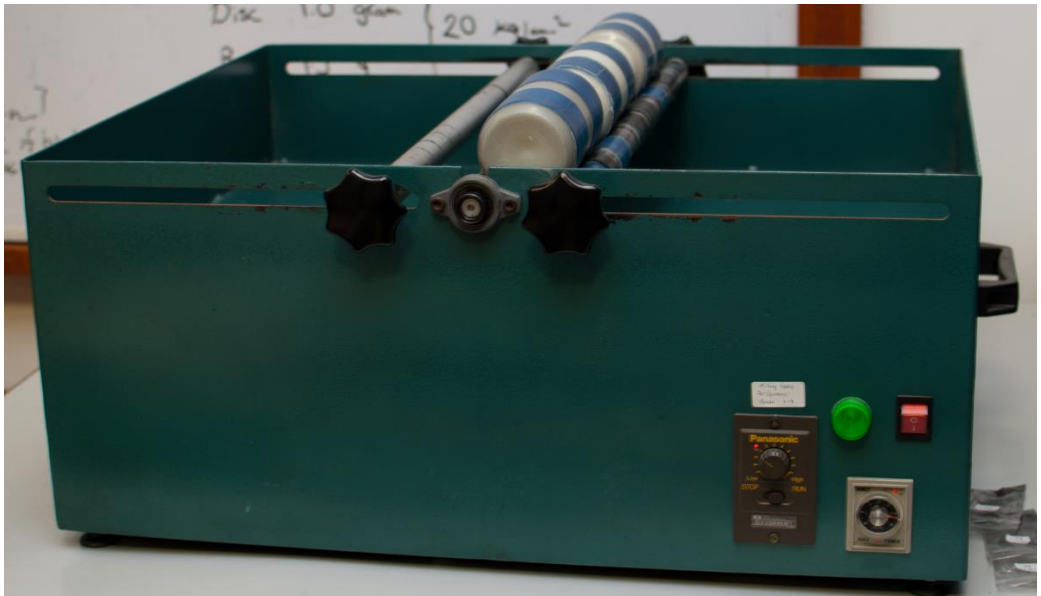


Figure C-7: Ball milling machine and milling media



Figure C-8: Endecotts stainless steel test sieve

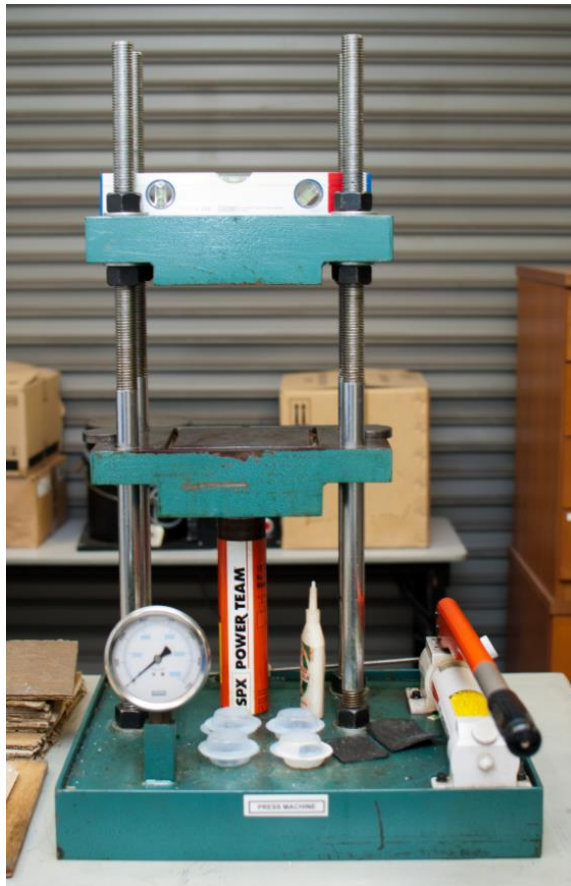


Figure C-9: Bench Press Machine



Figure C-10: Memmert oven used for drying samples



Figure C-11: 8.3kW Box Furnace (ModuTemp, Australia)



Figure C-12: Grinding machine (IMPTECH)



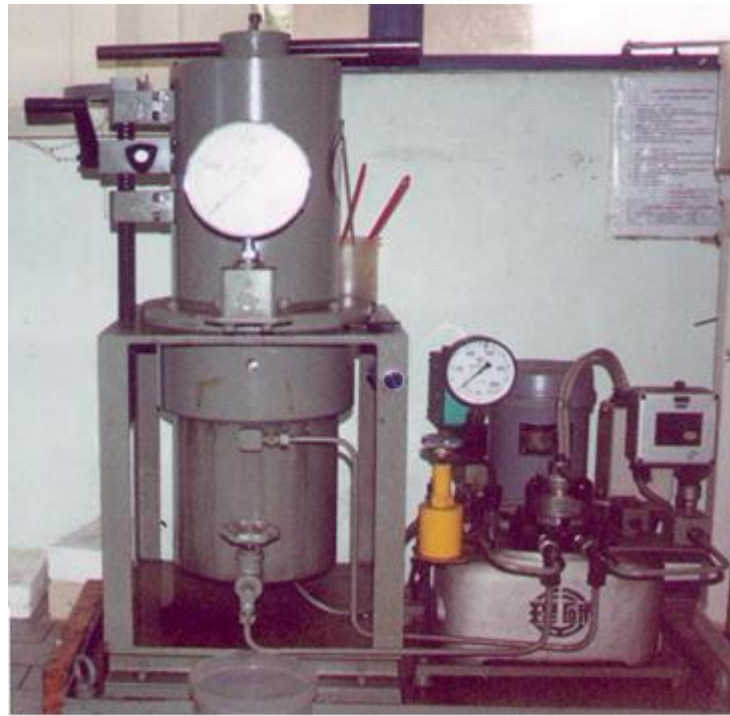


Figure C-13: Cold Isostatic Press Machine (Reiken Seiki Japan)



Figure C-14: X-ray Diffractometer (XRD) (Geiger-Flex, Rigaku, Japan)



Figure C-15: HMV Shimadzu Vickers micro hardness machine



Figure C-16: ZEISS AURIGA FESEM microscope



Figure C-17: Forsterite green disc samples



Figure C-18: Sintered forsterite disc samples





Figure C-19: Forsterite disc samples after quenching experiment