LIST OF FIGURES

Fig. I.1  Crystal structure of \( \text{La}_2\text{CuO}_4 \).
Fig. I.2  \( \text{CuO}_2 \) planes found in \( \text{La}_2\text{CuO}_4 \) as well as \( \text{YBa}_2\text{Cu}_3\text{O}_7 \).
Fig. I.3  The ligand field split levels of \( \text{Cu} \) 3d levels in octahedral environment.
Fig. I.4  The copper \( d_{x^2-y^2} \) and oxygen \( 2p \) orbitals involved in the relevant electronic band where the fermi level lies.
Fig. I.5  The schematic picture of the bonding, non-bonding and antibonding bands.

Fig. II.1  hkl reflections from a stationary mass of powder.
Fig. II.2  Setup of the X-ray diffractometer.
Fig. II.3  Geometrical conditions of focusing.
Fig. II.4  Experimental arrangement for resistivity.
Fig. II.5  Experimental arrangement for a.c. susceptibility.
Fig. II.6  Schematic diagram of X-ray spectrometer.

Fig. III.1  The structure of \( \text{YBa}_2\text{Cu}_3\text{O}_{7-\delta} \).
Fig. III.2  Schematic drawings of the unit cells of \( \text{YBa}_2\text{Cu}_3\text{O}_7 \) and \( \text{YBa}_2\text{Cu}_3\text{O}_8 \).
Fig. III.3  A perspective view of \( \text{YBa}_2\text{Cu}_3\text{O}_7 \) emphasizing the chains of \( \text{Cu}(1) \) and layers of \( \text{Cu}(2) \).
Fig. III.4  The coordination environments and bond lengths (Å) for \( \text{Cu}(1) \) and \( \text{Cu}(2) \).
Fig. III.5  XRD patterns for \( \text{YBa}_2\text{Cu}_3\text{O}_{7-\delta} \) samples.
Fig. III.6  Plot of transition temperature (\( T_c \)) Vs oxygen content (7 - \( \delta \)).
Fig. III.7  Resistivity plots for the \( \text{YBa}_2\text{Cu}_3\text{O}_{7-\delta} \) samples.
Fig. III.8  Variation of lattice constants with oxygen content.
Fig. III.9  Lattice parameters and oxygen index of \( \text{YBa}_2\text{Cu}_3\text{O}_{7-\delta} \) - a comparison of the experimental data available in the literature.
Fig IV.1 X-ray absorption spectrum of Vanadium metal.
Fig IV.2 X-ray absorption spectra of VO, V₂O₃, V₄O₇, V₂O₄, V₂O₅ and NaVO₃.
Fig IV.3 X-ray absorption spectra of CrVO₄, GdVO₄, Zn₄(VO₄)₂, Ca₃Fe₃VGeO₁₂ and Pb₂Cl(VO₄)₃.
Fig IV.4 X-ray absorption spectra of VOPC, VOTPP, (NH₄)₄[VOTart]₂.2H₂O, VO(bzac)₂, VO(acac)₂ and VOMoO₄.
Fig IV.5 X-ray absorption spectra of Tutton's salt, PbV₂O₆, Ca₃V₁₀O₂₈·16H₂O, [VO(hshed)(acac)], SmVO₃, V₅S₃, and VN.
Fig IV.6 X-ray absorption spectra of YBa₂(Cu₀.₉₈₋ₓFeₓO₇₋₅ where x = 0.04, 0.05 and 0.06.
Fig IV.7 Molecular orbital energy level scheme for octahedral vanadium compounds.
Fig IV.8 Molecular orbital energy level scheme for tetrahedral vanadium compounds.
Fig IV.9 A plot of ΔE(3d-4p) versus 1/R² for vanadium compounds.
Fig. V.1 Structure of YBa₂Cu₄O₈ unit Cell
Fig. V.2 Variation of the lattice parameters a, b, and c with x for the YBa₂(Cu₁₋ₓFeₓ)₄O₈ samples
Fig. V.3 Variation of the lattice parameters a, b, and c with x for the YBa₂(Cu₁₋ₓNiₓ)₄O₈ samples
Fig. V.4 a.c. susceptibility of pure YBa₂Cu₄O₈ specimen at 0.1 Oe rms.
Fig. V.5 R-T Plots for YBa₂Cu₄O₈ samples at different doping levels of Fe [(a) and (c)] and Ni [(b) and (c)].
Fig. V.6 Plot of ln ρVₙT⁻¹/₃ and ln ρVₙT⁻¹/₄ for the Fe 10-at.% and Ni 5-at.% samples.
Fig. V.7 Plot of the logarithm of the local activation energy [d ln(ρ)/d(1/T)]Vₙ logarithm of the inverse temperature 1/T for the Fe 10-at.% and Ni 5-at.% samples.