Chapter 4
Raman Biospectroscopy and Imaging

Smilja Todorovic

Abbreviations

A	Adenine
Ab	Antibody
AFM	Atomic Force Microscopy
BCA	Basic component analysis
C	Cytosine
CcO	Cytochrome c oxidase
Cys	Cysteine
cyt *c*	Cytochrome c
CCD	Charge coupled device
CV	Crystal violet
CVa	Crystal violet acetate
DET	Direct Electron Transfer
DPA	Dipicolinic acid
DyP	Dye decolorizing peroxidase
E^0	Midpoint redox potential
EndoIII	Endonuclease III
ET	Electron Transfer
FT	Fourier Transform
G	Guanine
Hb	Hemoglobin
HCO	Heme copper oxidase
HPV	Human papilloma virus
HRP	Horse radish peroxidase

S. Todorovic (✉)
Raman Biospectroscopy Laboratory, Instituto de Tecnologia Química e Biológica António Xavier ITQB-NOVA, Universidade NOVA de Lisboa, 2780-157 Oeiras, Portugal
e-mail: smilja@itqb.unl.pt

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HS	High spin
k_{ET}	Electron transfer rate constant
LDA	Linear discriminant analysis
LMCT	Ligand to metal charge transfer
LS	Low spin
Mb	Myoglobin
MBA	4-mercaptobenzoic acid
MNP	Magnetic nanoparticle
NiR	Nitrite reductase
NP	Nanoparticle
P450	Cytochrome P450
PCA	Principal component anlysis
Phe	Phenylalanine
PLS-DA	Partial least squares-discriminant analysis
PSII	Photosystem II
QS	Quantum spin state admixture
RR	Resonance Raman
RS	Raman spectroscopy
SAM	Self assembled monolayer
SAM	S-Adenosyl methionine
SER(S)	Surface Enhanced Raman (spectroscopy)
SERR(S)	Surface Enhanced resonance Raman (spectroscopy)
SESORS	Surface-enhanced spatially offset Raman spectroscopy
SHE	Standard hydrogen electrode
T	Thymine
TERRS	Tip Enhanced resonance Raman spectroscopy
TERS	Tip Enhanced Raman spectroscopy
TR	Time resolved
TRS	Transmission Raman Spectroscopy
Tyr	Tyrosine
U	Uracil
UVRR	Ultraviolet resonance Raman

4.1 Introduction

Raman spectroscopy is a light scattering technique which, like IR, probes vibrational levels of a molecule; the spectra are therefore molecule-specific and represent its vibrational fingerprint (Siebert and Hildebrandt 2008). It is named after Indian physicist C. V. Raman who was awarded the Nobel Prize 'for his work on the scattering of light and for the discovery of the effect named after him' in 1930 (Raman and Krishnan 1928). Raman spectroscopy and more recently Raman imaging have been increasingly popular in life sciences and biomedicine, due to the non-destructive and