

Contents

1. Nanomaterials: A brief introduction	1
2. Tissue and blood-material interactions	2
2.1 Tissue response	2
2.2 Blood response	2
2.3 Cellular response	3
3. Biocompatibility	4
4. Biodegradation	4
5. Biocompatible and biodegradable nanomaterials	6
5.1 Organic nanomaterials	6
5.1.1 Natural and modified natural nanomaterials	6
5.1.2 Synthetic polymeric nanomaterials	6
5.2 Stealth nanomaterials	8
5.3 Inorganic nanomaterials	10
5.3.1 Carbon nanotubes (CNTs)	10
5.3.2 Quantum dots (QDs)	11
5.3.3 End-capped mesoporous silica nanoparticles	12
5.4 Metal nanoparticles	12
5.4.1 Gold nanoparticles (Au-Nps)	13
5.4.2 Silver nanoparticles	13
5.5 Magnetic nanoparticles	14
5.6 Nanocomposites, nanofibres and nanowires	15
5.7 Hybrid nanomaterials	15
5.8 Virus-like nanocarriers	16
5.9 Multifunctional nanoparticles	17
6. Biomacromolecules	19
6.1 Cell penetrating peptides in biomacromolecular delivery	19
6.2 Targeted biomacromolecular delivery	21
7. Challenges in biomacromolecular delivery	22
8. Preparation techniques of biocompatible nanostructures	24
8.1 Top-down techniques	24
8.1.1 Dispersion of preformed polymers	24
8.1.2 Polymerization methods	25
8.1.3 Ionic gelation method for hydrophilic polymers	25
8.1.4 Hybrid assemblies	25
8.2 Bottom-up techniques	26
8.3 Scalable methods	27
9. Characterization and evaluation	28
9.1 Drug-polymer compatibility	28
9.2 Particle size and shape	28

9.3	Zeta potential	29
9.4	Drug release evaluation	29
9.5	Conformational stability	30
9.6	Biocompatibility studies	30
9.7	Pre-clinical evaluation	30
10.	Regulatory perspectives	32
11.	Industrial viability	36
12.	Conclusions	37
	References	38