Literature Review

1. **Juergen Siepmann Florence Siepmann et al., 2006** Reviewed an overview on the most important past, current and future strategies using drug-loaded microparticles to improve the efficiency of various medical treatments. Special emphasis is laid on the different types of preparation techniques that are commonly used, the physicochemical properties of the devices and practical examples illustrating the considerable benefits of this type of advanced drug delivery systems.

2. **Majeti N. V. Ravi Kumar et al., 2000** Revealed the concept of microparticles that Microspheres are in strict sense, spherically empty particles. However, the terms microcapsules and microspheres are often used synonymously.

3. **Wasfy M. Obeidat et al., 2009** Described and allocated the several methods and techniques are potentially useful for the preparation of polymeric microparticles in the broad field of microencapsulation.

4. **NS Dey, S Majumdar and MEB Rao et al., 2010** Reviewed today’s drug delivery technologies enable the incorporation of drug molecules into a new delivery system, thus providing numerous therapeutic and commercial advantages. Multiparticulate drug delivery systems provide several all the advantages including greater flexibility and adaptability of microparticulate dosage forms.

5. **J. Ravi Kumar Reddy et al., 2009** Formulated and evaluated microparticles of Metronidazole and observed the delayed release of Metronidazole microparticles, by using CAP, HPMCP, EudragitL-100 and Eudragit S-100 as coating materials.

6. **Abhay N. Padalkar and et al., 2011** various polymers have used in the formulation of microparticles for drug delivery research to increase therapeutic benefit, while minimizing side effects. The review embraces various aspects of microparticle formulations, characterization, effect of their characteristics and their applications in delivery of drug molecules and therapeutic genes.

7. **Sachin E. Bhadke et al., 2006** Reported formulation and development of repaglinide microparticles by ionotropic gelation technique using various polymer to sustain the action of drug.
8. **P. Burns [et al., 2002]** Reported the Emulsion/Aggregation Technology as a new process for preparing micronized polymeric microspheres with narrow particle size distribution. It is called the Emulsion/Aggregation (EA) technology and was originally developed for the controlled growth of particles for electrophotographic applications.

9. **Prashant Singh [et al., 2005]** Reviewed microparticles as an advancement in novel drug delivery system and there are various approaches in delivering a therapeutic substance to the target site in a sustained controlled release fashion. One of such approach is using microspheres as carriers for drugs.

10. **Severine Jaspart [et al., 2011]** Studied solid lipid microparticles loaded with salbutamol acetonide were prepared by hot emulsion technique and evaluated for various parameters.

11. **N.V. Satheesh Madhav [et al., 2010]** reviewed on study various aspects of the microparticulate drug delivery system including method of formulation, evaluation & characterization.

12. **Swarupananda Mukherjee [et al., 2006]** Prepared controlled release Nifedipine microparticulate system utilizing starch acetate as the rate controlling polymer. The prepared microparticles were subjected to standard evaluation.

13. **Amal H. El-Kamel [et al., 2005]** Prepared captopril sustained release microparticles by solvent evaporation technique and analyzed the effects of polymer molecular weight, polymer composition and drug : polymer ratios on the particle size, flow properties, morphology, surface properties and release characteristics of the drug.

14. **L. Giovannelli [et al., 2005]** Worked on characterization of nifedipine microparticles prepared by Hot Air Coating by cetaryl alcohol (CA) in different proportions (30:70, 50:50, 70:30).

15. **Duane T. Birnbaum [et al., 2010]** Prepared biodegradable microspheres containing luteinizing hormone-releasing hormone (LHRH) are already used for treatment of hormone dependent cancers and precocious puberty.

16. **S. S. Bansode [et al., 2009]** The review covered encapsulation materials, physics of release through the capsule wall and/or desorption from carrier, techniques of preparation, many uses to which microcapsules are put.
17. **A.V Yadav** et al., 2007 Formulated and evaluated enteric microcapsules for improved delivery to the intestine using the polymer ethyl cellulose as the retardant material.

18. **KC Ofokans** et al., 2007 Formulated Microspheres Based on Gelatin-Mucin Admixtures for the Rectal Delivery of Cefuroxime Sodium and Reported that swellable microspheres based on polymers or their admixtures are frequently employed as drug delivery systems to achieve a controlled release and site-specific targeting of the incorporated drug.

19. **Simon Benita** et al., 2005 Reported to find new or to improved microencapsulation techniques to process newly discovered active molecules is in constant progress because of the limitations of the current pharmacopeia.

20. **Li Dong Xun** et al., 2009 Developed, nifedipine-loaded gelatin microcapsule containing nifedipine and ethanol in gelatin shell by using a spray-dryer, and then coated microcapsule was prepared by coating the gelatin microcapsule with Eudragit acrylic resin. The dissolution test and the bioavailability of the coated microcapsule in rats were evaluated compared to nifedipine powder.

21. **M.N. Singh** et al., 2009 Reviewed the general aspects and recent advances in drug-loaded microparticles to improve the efficiency of various medical treatments. An appropriately designed controlled release drug delivery system can be a foot ahead towards solving problems concerning to the targeting of drug to a specific organ or tissue, and controlling the rate of drug delivery to the target site.

22. **Sandile M. Khamanga** et al., 2002 Prepared microcapsules of eudragit RS and RL Containing verapamil and propranolol and to evaluate the kinetics and mechanism of drug release from the microcapsules.

23. **Ali Nokhodchi and Djavad Farid** [2009] The authors microencapsulated paracetamol using the emulsion solvent evaporation (ESE), modified emulsion solvent evaporation (MESE), and emulsion nonsolvent addition (ENSA) methods. All three methods were reproducible in terms of the drug content, microcapsule size, and release rate of the drug from the microcapsules. Significant differences resulted among the three methods in terms of the time necessary for microcapsule formation, drug content, microcapsule size, and drug release rate.
24. K.P.R. CHOWDARY [et al., 2010] Used olibanum resin and colophony as natural coat materials for preparation of nifedipine microcapsules and evaluated for various parameters.

25. MD. Sarfaraz [et al., 1996] Prepared Rifampicin biodegradable microcapsules emulsification-ionic gelation method for a novel controlled release product. Sodium alginate and Carbopol 974P were used as coating polymers in different ratios.

26. Chowdary KPR [et al., 2009] Studied Microencapsulation of nifedipine-MCC solvent deposited system for sustained release Nifedipine and its solvent deposited systems on Microcrystalline Cellulose (MCC) were microencapsulated with cellulose acetate by an emulsification solvent evaporation method and the microcapsules were studied.

27. Deore B.V. [et al., 2010] Worked on Ketoprofen microspheres prepared by a solvent diffusion technique using Aerosil as an inert dispersing carrier to improve the dissolution rate of ketoprofen, and Eudragit RS as a retarding agent to control the release rate.

28. Solmaz Dehghan [et al., 2010] Drug loaded microspheres were prepared using Eudragit RL100, through solvent evaporation technique. In the next step, the effect of different formulation variables, including the amount of polymer (1 - 2 g), stabilizer (0.1 - 0.5 g) and drug/polymer ratio (0.05:1 – 0.1:1) on the appearance, physical properties of particles, and the amount of loaded drug was investigated.

29. Silva CM [et al., 2006] Chitosan-coated alginate microspheres prepared by emulsification/internal gelation were chosen as carriers for a model protein, hemoglobin (Hb). The influence of process variables related to the emulsification step and microsphere recovering and formulation variables studied.

30. Chinna Gangadhar B. [et al., 2010] Microspheres were prepared by solvent evaporation method using an acetone / liquid paraffinsystem and Phase separation co-acervation method using petroleum ether and coconut oil as dispersionand continuous phase systems.

31. Angela Lopedota [et al., 2010] Developed a novel microparticulate system based on the mucoadhesive polymer Eudragit-RS 100 and cyclodextrins (CDs), potentially useful for the oral administration of Glutathione (γ–glutamylcysteinylglycine, GSH).
32. **M Narender Reddy et al., 2000** Microcapsules of diltiazem hydrochloride with rosin were prepared by an emulsion-solvent-evaporation technique. Different amounts of drugs were added in order to obtain various drug to polymer ratios.

33. **M. Regina Brophy and P-B. Deasy et al., 2010** A matrix containing suspended drug and PHB or its copolymers PHB/PHV was prepared by a solvent evaporation process. The matrix was subsequently ground to give irregular particles of a desired size range and assayed in vitro and in vivo for its release characteristics.

34. **Felipe Prósper et al., 2010** rhVEGF165-loaded microparticles were prepared by the solvent extraction/evaporation method using TROMS.

35. **Stephane Gibaud et al., 2002** Microparticles were formulated with modified O/W and W/O/W methods. Poly(-caprolactone) microparticles were prepared either with a suspension-in-oil-in-water (S/O/W) solvent evaporation method or by complexation of melarsoprol with methyl β-cyclodextrin followed by a water-in-oil-in-water (WCD/O/W) solvent evaporation method.

36. **Tae Gwan Park et al., 2001** This study reveals that sustained rhGH release could be achieved by microencapsulating reversibly dissociable protein aggregates within biodegradable polymers.

37. **Udupa N. et al., 1994** Developed implantable formulations of Flubiprofen using biodegradable aliphatic polyesters, hydrophilic polymers like alginates and HPMC by ionotropic gelation technique, in the form of films, microspheres and pellets for treating chronic inflamed conditions associated with arthritis.

38. **Kakkar A.P. 1995** Developed and characterized Ibuprofen loaded microcapsules with sodium alginate and calcium chloride by ionotropic gelation technique. Spherical, smooth surfaced alginate microcapsules of Ibuprofen were obtained by this method. The preparation was based on dispersion of sodium alginate-Ibuprofen matrix in liquid paraffin followed by coating process by calcium chloride.

39. **M. Guzman, J. Molepeceres et al., 1996** Prepared, characterized poly-e-caprolactone and hydroxyl propyl methyl cellulose phthalate ketoprofen loaded microspheres by encapsulating the ketoprofen within poly-e-caprolactone and hydroxyl propyl methyl cellulose phthalate.
40. **M. Cuna, M. L. Lorenzo-Lamosa [et. al., 1997]** Prepared pH dependent cellulotic microspheres containing Cefuroxime Axetil: Stability and In-vitro release behavior by using CAT (cellulose acetate trimellitate) and two types of hydroxyl propyl methyl cellulose phathalate, HPMCP-55 and HPMCP-50 were obtained by solvent extraction procedure.

41. **F.Cilurzo,P.Mangetti A. Caseraghi [et.,al 2002]** The HPMC is used as solubility enhancer by solid dispersion technique. Hence the required concentration of nifedipine can be achieved in blood.

42. **M.J.Arias [et.,al 2002]** Studied dissolution properties and invivo behavior of triamterene in solid dispersions with poyethylene glycols, thus PEG used as solubility enhancer.

43. **Ganza A. Gonzalcz[et. al., 1999]** Reported the preparation of chitosan and chondroitin microspheres of metoclopramide by using solvent evaporation technique and evaluated for various parameters.

44. **Chikwa H. Z. [et. al., 1997]** Prepared the prolonged release microcapsules of Diclofenac sodium by solvent evaporation technique and analysed effect of various polymers ratio on drug release.

45. **David J.W. Grant [et. al., 2002]** Studied solid-state characterization of Nifedipine solid dispersion and Effect of inclusion complexation with cyclodextrins on photostability of Nifedipine solid state.

46. **Agar Ali [et., al., 1998]** Prepared the Sustained release microparticales of nifedipineby using polyvinyl acetate as rate retarding polymer and evaluated for various parameters.

47. **Takada,Y. Yamagerta [et. al.,2002]** Reported the sustained release of human growth hormone from microcapsules prepared by solvent evaporation technique.

48. **Gopte[et.al.,2004]** Formulated paclitaxed S-fu and palitaxel +5 FU PLGA micro spheres by modified evaporation technique. Microencapsulation efficiency was found high ie (100% & 90%)

49. **Gibaud[et. al., 1997]** Prepared diaminopymmidine micro particles by solvent evaporation technique using PCL, scanning electron microscopy did not shown any crystals result showed that 3,4- BAB incorporated by milligram of powder was very low (1.91 mcg/ml).
50. **Anand Eldin Hassan [et. al., 1997]** Prepared prolonged release lipid micropillets by emulsion congealing ketoproten has used as a core material.

51. **Guyout M. and Fawaz [et. al., 1998]** Reported the Nifedipine loaded polymeric microspheres: preparation and physical characteristics.

52. **Hideki. Z Chikawd [et. al., 1997]** Formulated the 100 µm sized Microcapsules with prolonged release by using western process.

53. **A. Khan and Vikas Agrawal [et. al., 1997]** Prepared Polymethylacrytate Based micropartriculates of insulin for oral delivery and studied for the invitro dissolution stability in presence of enzyme inhibition.

54. **Alf [et. al., 2005]** Formulated the 5 FW loaded Eudragit P. 413 of microsphere by o/W emulsion –solvent evaporation technique for treatment of colon cancer.

55. **Gripeg [et. al., 1997]** Reviewed the pharmaceutical application solid dispersions griseofulvin and carriers polyvinyl pyrotidone and polyethylene glycol.