

Crystalline modifications and solubility of prepared crystal



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LITERATURE REVIEW

Tejal Prajapati et. al., (2010) Investigated different crystal forms of carbamazepine was prepared from various solvents. Crystalline modifications and the solubility of prepared crystals and immediate release tablet dissolution rate profile of carbamazepine studied by using in vitro dissolution studies. These obtained crystal forms of carbamazepine and pure drug was characterized by SEM, FTIR, PXRD and DSC. Highest solubility profile shown by Crystals obtained from ethanol at room temperature and it gave better in vitro dissolution drug release profile than all other forms.

Nokhodchi et. al., (2010) Developed ibuprofen crystal forms by using solvent change crystallization technique. Ibuprofen was dissolved in ethanol, and then that solution was crystallized with water in the presence or absence of different types of hydrophilic additives or polymers (like PEG 6000, 8000, Brij 98P and PVA 22000) and using with different concentration ratios. Physico-mechanical properties of Ibuprofen crystals were studied by density, flow property, tensile strength and dissolution behaviour and characterized by SEM, DSC and FT-IR. Ibuprofen crystals crystallized with presence of PEG 6000, 8000 and PVA shown reliable increase in the tensile strengths results of the directly compressed tablets.

Talluri chandrashekar et. al., (2010) Developed four different types of Chlorzoxazone polymorphs (Form I, Form II, Form III and Form IV) by using different types of solvents. The obtained polymorphs were characterized by using Optical Microscopy, DSC, XRD and IR spectroscopic methods. From the

studies it was revealed that the Form I, Form II shown higher solubility rate profile than Form III, Form IV and pure drug.

Rajesh A. Keraliya et. al., (2010) Investigated 14 pure good solvents were selected for the crystallization of tolbutamide. Crystals were obtained in only 10 solvents out of the all 14 solvents. These developed Crystal forms were characterized by using differential scanning calorimetry, optical microscopy, and in vitro dissolution study. Differential scanning calorimetry study shown all types of crystals were determined as isomorphous. Crystal forms of tolbutamide gave different dissolution rates.

Cheng-Hung Hsu et. al., (2010) Studied transformation of different gabapentin polymorphs forms. Four types of gabapentin polymorphs were developed and these are characterized by using DSC, TGA, FTIR Microspectroscopy and X-ray powder diffractometry. A one-step novel hot-stage FTIR microspectroscopy was successfully applied to progressive processes of polymorphic forms transformation of prepared crystals.

Gen Hasegawa et. al., (2009) Prepared different types of tolbutamide polymorphs and thermodynamic stability was characterized by using calorimetry and spectroscopic analysis. Forms I-III The heat of solutions (ΔH) measurements were observed in solvent of dimethylsulfoxide between 298.2 K and 319.2 K. Solubility data also observed and then confirmed the change in ΔH of Form I around 308.2 K. XRD, DSC measurements of Form I characterized as a polymorphic transformation was observed at 311K. The crystal forms structure of the Form I was determined by using PXRD pattern, and solid-state NMR spectrum confirmed the

transformations occurred in the prepared crystal form structure of tolbutamide Form I.

Roya Talari et. al., (2009) Investigated Gliclazide was recrystallized and developed polymorphs with 12 different types stabilizers and each stabilizer gives effect on micromeritic behaviors, microcrystals morphology, dissolution rate profile and recrystallized gliclazide solid state were studied.

Recrystallized samples showed faster dissolution rate than gliclazide pure drug and the fastest dissolution rate profile was observed the samples recrystallized with PEG 1500 stabilizer. XRPD and DSC results confirmed that crystallization of gliclazide forms with stabilizers reduced the crystallinity of the samples.

Renu Chadha et. al., (2009) Prepared five different crystal forms of methotrexate and Characterized by using XRPD and DSC. Desolvation endotherm was determined by the DSC. In I, II, IV and V crystal forms mass losses were observed in TGA and shown these forms are acetonitrile solvate hydrate, dimethylformamide solvate and trihydrate (I, V, II and IV) respectively. Desolvation peak was not observed in Prepared from methanol crystal form (form III) and that indicates the absence of solvent of crystallization. This form III was shown partially crystalline pattern by its XRPD. All prepared forms the dissolution and solubility rate profiles were correlated with enthalpy of solution and subsequently to the crystallinity of all four forms of methotrexate; and crystal form III shown highest dissolution rate than other prepared forms.

Mange Ram Yadav et. al., (2008) Developed five different types of crystal forms of Pefloxacin by using with different solvents of varying polarities, and the dissolution kinetics of five polymorphs was observed. That revealed these polymorphs differed in their dissolution rate profiles and all polymorphs shown unusual behavior in highest dissolution rate profile at the end of 15 min after that some what similar dissolution rate. Finally got constant dissolution release values after 4 hrs.

Shan-Yang Lin et. al., (2007) Investigated two polymorphic forms A & B of famotidine. It describes famotidine polymorphic transition may produce by the grinding or compression process in ground mixtures or compressed compacts in tableting process time. The synergistic effect of temperature on the grinding or compression process was also investigated. In the ground mixtures, famotidine polymorphic transition was characterized by confocal Raman Microspectroscopy, DSC. Mechanical forces, which are grinding and compression, are having effect on polymorphic transformation of Famotidine.

Ilma Nugrahani et. al., (2007) Evaluated amoxicillin trihydrate and potassium solid state interaction. The solid state interaction was characterized by using DSC, XRPD, FTIR and SEM. Different compositions of amoxicillin trihydrate and potassium clavulanate were developed in ten different molar ratios and characterized by DSC to get the thermal profile and a phase diagram of composition. Binary systems thermo profile obtained by DSC analysis that endothermic curves of molar ratios of 1: 9-5: 5 overlapped at 201°C. the molar fraction ratio of 5: 5 shown the loss of hydrate spectra in amoxicillin trihydrate characterized by FTIR spectrum of binary system. We conclude co-

crystal system produced by the strong hydrogen bonding interaction between hydrates of amoxicillin and potassium clavulanate.

Cristina Puigjaner et. al., (2007) Investigated new polymorphic forms A, B & C of Norfloxacin. These polymorphs forms were characterized by different methods like powder X-ray diffraction, Vibrational spectroscopy (IR and Raman), thermal analysis (DSC and TG), SEM and solid-state NMR spectroscopy. The data show an enantiotropic relationship between A & C forms, as well as a monotropic relationship between B & C.

C. G. Kontoyannis et. al., (2007) Reported Risperidone polymorphic forms of film coated commercial tablets and characterized by using IR spectroscopy, Raman spectroscopy and X-ray powder diffraction. This Risperidone polymorph stability was examined through time and during the manufacturing process. The inability of IR and Raman techniques to identify the presence of polymorph A in the tablets. Form A was proved to be stable during the manufacturing process time and after the storage period of 2 years.

Wang Jingkang et. al., (2007) Reported crystal habit of 11 β -hydroxy-16 β , 17 β -epoxyprogesterone (HEP) grown from solution by the effects of solvent and impurity were characterized by using SEM. Long prismatic crystals were formed from crystallization of HEP in pure acetone and N, N-dimethylformamide. Blocky crystals were resulted with pure chloroform by using cooling crystallization method. These HEP crystals were greatly modified from prismatic to octahedral shape. That the change of crystal

habit was brought from the modification of crystal structure by DSC and X-ray powder diffraction.

Piera Di Martino et. al., (2007) Reported crystal forms of nimesulide prepared by crystallizing from an ethanol solution and dioxane, different from the pure drug nimesulide reference sample, it was characterized by using XRPD, DSC and solid cross polarization-magic angle spinning NMR. Dioxane nimesulide forms are solvate. The polymorphic form prepared by desolvation of dioxane solvate gave positive effect on nimesulide forms tableting properties increasing the both compressibility and tableability.

Joao Canotilho et. al., (2007) Prepared crystalline forms of atenolol from evaporation of an ethanol/water solution. (R, S)-Atenolol crystallizes in the centrosymmetric and S-atenolol crystallizes in a noncentrosymmetric space group C2/c and space group C2 respectively. One symmetry and two symmetry independent molecule in (R, S)-atenolol crystals and molecules in S-atenolol respectively. (R, S)-atenolol shown two different molecular conformations and three different conformations were isolated in S-atenolol.. The molecular conformations characterized by X-ray diffraction method were fully relaxed at the HF/6-31G* level of theory.

Reddy et. al., (2005) Investigated a novel crystalline form of cetirizine monohydrochloride was prepared. These prepared crystalline forms of cetirizine monohydrochloride were characterized by using x-ray diffraction pattern, differential scanning calorimetry.

Kati Pollanen et. al., (2005) Prepared polymorphic forms of sulfathiazole.

These polymorphic forms composition of bulk product samples characterized <https://assignbuster.com/crystalline-modifications-and-solubility-of-prepared-crystal/>

by diffuse reflectance Fourier transform infrared spectroscopy together with multivariate statistical process control analysis, soft independent modeling of class analogy, orthogonal signal correction preprocessing and partial least squares regression methods.

Ali Arslantas et. al., (2005) Investigated L-ascorbic acid polymorphs considered as eight space groups and assuming one molecule in the asymmetric unit. Including with the experimental structure and number of possible crystal structures were found. By removing space-group symmetry constraints, the number of hypothetical crystal structures was reduced.

Schmidt et. al., (2005) Reported Benzocaine (BZC), butambene (BTN) and isobutambene (BTI) are ester type basic local anaesthetic agents. These are exist in two polymorphic crystal forms and characterized by thermomicroscopy, DSC, FTIR, FT-Raman-spectroscopy and XRPD. The endothermic transformation of mod. I0 at ambient conditions thermodynamically stable (heat of transition rule). Whereas mod. II and mod. I0 enantiotropic in nature and mod. II is metastable at temperatures. At room temperature the metastable forms show different kinetic stabilities.

Vijayavithal T Mathad et. al., (2005) Prepared six polymorphs of donepezil hydro bromide from different types of solvents, and these polymorphs physical properties are characterized by PXRD, DSC, TGA, IR spectroscopy and Karl Fischer techniques. It revealed one is crystalline hydrate, four are anhydrous polymorphs and one is amorphous form.

Arvind k. Bansal et. al., (2004) Studied clopidogrel bisulphate polymorphic form I and form II. Obtained polymorphs were characterized by Thermal <https://assignbuster.com/crystalline-modifications-and-solubility-of-prepared-crystal/>

(DSC, TGA, HSM), crystallographic (XRD) and spectroscopic (FTIR) methods. Differences in their spectral patterns were successfully utilized for the quantification of forms I and II in powder mixtures. The forms undergo no transformations and exhibit no crystal defect generation when exposed to pressure during the KBr pellet formation. FTIR method was successfully characterized and validated for the quantification of prepared clopidogrel bisulphate polymorph form I in polymorph mixtures.

David J. W. Grant et. al., (2004) Reported two polymorphic forms of s Piroxicam. The difference in energy of the two polymorphs, I and II, of Piroxicam arises predominantly from the difference between their lattice energies, rather than between their conformational energies. A loss of polymorphic memory was observed upon cryogrinding, the two polymorphs are leading to differences in their recrystallization behavior between Piroxicam amorphous prepared in polymorphs I and II. di

Young-Taek Sohn and Hyun Ok Seo et. al., (2004) Developed four types of crystal forms of ketorolac by recrystallization from various organic solvents under variable conditions. Different types of ketorolac polymorphs and pseudopolymorphs were characterized by XRPD, DSC, and thermogravimetric analysis. All four crystal forms showed different types of dissolution studies in water at 37 ± 0.5 °C. Form I shown the highest solubility. Polymorphic forms of Form I and Form III shown good physical stability at room temperature for 60 days. After 60 days storage Form IV is converted to Form I and Form II is converted to Form III.

Sari Airaksinen et. al., (2004) Investigated two polymorphic forms of theophylline monohydrate. Theophylline monohydrate transforms either stable (form I), or metastable (form I^{â-}) form of anhydrous theophylline during the drying phase of wet granulation method. Amounts of the different theophylline crystalline forms remaining in the form of dried granules were characterized by using XRPD and near-infrared spectroscopy. It conclude the Metastable anhydrous theophylline was the major form that was produced at drying temperatures of 40-50 °C with both MMFD and VT-XRPD drying techniques.

Mahua Sarkar et. al., (2008) Developed nevirapine polymorphic forms from different types solvents under various conditions by crystallization. These forms solid-state behavior was characterized by using variety of complementary techniques such as microscopy (optical, polarized, hot stage microscopy), DSC, TGA, FT-IR and powder X-ray diffractometry. Nevirapine forms crystallized from varying polarities and yielded different crystal habits. The recrystallized sample intrinsic dissolution rate of was lower than the commercial sample. Nevirapine Amorphous form shown slightly higher aqueous solubility than commercial sample.

Makoto Otsuka & Fumie kato et. al., (2003) Investigated indomethacin polymorphic content in mixed pharmaceutical powder and tablets by using rapid chemometrical near-infrared spectroscopy. Polymorphic contents of forms I[±] and I^³ were obtained from physical mixing of IMC standard polymorphic sample 50% and excipient mixed powder sample consisting of lactose, corn starch, and hydroxypropyl-cellulose 50% in Mixed powder samples. 6 kinds of standard materials with various polymorphic contents <https://assignbuster.com/crystalline-modifications-and-solubility-of-prepared-crystal/>

were characterized by using X-ray powder diffraction profiles and NIR spectra. more accurate quantitative analysis of polymorphic content provided by NIR spectroscopy in pharmaceutical mixed powder and tablets.

Sabiruddin Mirza et. al., (2003) Developed crystal forms erythromycin with various organic solvents, (acetone, methylethylketone, ethanol, and isopropanol) both in the presence and in the absence of water on the crystallization. It was observed that pure organic solvent or water-organic 1: 9 or 1: 1 solvent mixtures are solvate. However, the recrystallization of erythromycin from 2: 1 water-organic solvent mixture gives crystal hydrate form. that the loss of volatiles by all the solvated crystals is nonstoichiometric showed by Thermo-gravimetric analysis. The solvates with the organic solvents desolvation behavior of characterized by variable-temperature x-ray powder diffraction.

R. Fausto et. al., (2003) an amorphous state produced by Fast cooling rates that, on more heating, that crystallizes into metastable polymorph. At higher temperatures, this metastable crystalline form converts into the stable crystal form. Cooling rates is intermediate produce 3AP crystallizes as the metastable polymorph, the solid I solid transition occurring on heating and this form into the stable polymorph. cooling rate is Slower enable formation of the stable crystal on cooling. The two crystalline polymorphs were characterized by using powder X-ray diffraction and Raman spectroscopy. It concluded that different types of conformations are assumed by the individual molecules of 3AP in two crystalline forms.

Amy J. Harshaw et. al.,(2003) Examined four polymorphic crystalline forms sulfathiazole exist in solvents used n-propanol, acetone/chloroform, water. These forms were characterized by using differential thermal calorimetry and solubility studies and these are recrystallizing under the various conditions as a function of temperature. The best polymorph formation was found in the hot water sample.

Adam J. Matzger et. al., (2002) Developed new polymorph crystal structure of nabumetone. Energy differences gives weak forces, these weak forces play such an important role in the kinetic and thermodynamic stabilization of nabumetone polymorphs

Judith Maria Rollinger et. al., (2002) Prepared three crystal forms of torasemide from various types of organic solvents. These forms Physicochemical properties were characterized by using thermoanalysis (hot-stage microscopy, differential scanning calorimetry, thermogravimetry), Fourier transform infra-red and Raman spectroscopy, and X-ray powder diffractometry. The hygroscopicity, relative stability, true density, and heat of solutions were determined. The dissolution behaviour of mod. I and II was investigated as a function of pH, temperature, and in addition to surfactants.

S. Agatonovic-Kustrin et. al., (2001) Developed two polymorphic forms 1 and 2 of ranitidine HCl. This polymorphic purity of crystalline ranitidine HCl characterized by using solid-state techniques, diffuse reflectance FT-IR and XRPD were combined. The ranitidine HCl polymorphs and quantify the composition of binary mixtures of the two polymorphs clearly distinguished by DRIFTS combined with XRPD Successfully.

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A. R. Rajabi-Siahboomi et. al., (2001) Investigated crystal form of Ibuprofen was obtained from various solvents like methanol, ethanol, isopropanol, and hexane. The crystal forms of ibuprofen were crystallized from methanol and ethanol gave polyhedral crystal habit, while hexane was given needlelike, isopropanol was shown elongated crystals. XPD and DSC studies results are these samples were structurally similar; the results shown that crystal habit modification of prepared crystals have a great influence on the mechanical properties (compressibility, flow rate, and bulk density) of obtained ibuprofen crystals.

John Bauer et. al., (2001) Prepared Ritonavir polymorphs from various solvents characterized by using solid state spectroscopy and microscopy techniques, solid state NMR, NIR, PXRD and Single crystal X-ray. A strong hydrogen bonding network gives an unusual conformation for form II. Ritonavir was found to be exhibit two unique crystal lattices conformational polymorphism. Which are having different solubility properties. Although the polymorph (form II) belongs to the “ cis” confirmations it is a more stable packing arrangement, nucleation.

Changquan Sun and David J. W. Grant et. al., (2001) Reported bulk powders of sulfamerazine polymorph I and two different particle size of polymorph II , II(A) and II(B) were crystallized. The powders were compressed to form tablets whose porosity and tensile strength were measured and then analysed. The tabletability, follows this order, $I \gg II(A) > II(B)$ and the compressibility, follows the order, $I \ll II(A) < II(B)$. Therefore, the superior tabletability of I over II(A) or II(B) is attributed to its greater compressibility.

Slip planes provide I crystals greater plasticity and therefore greater compressibility and tableability.

Malamataris et. al., (2000) Prepared crystalline form of glibenclamide, with higher melting point (218°C) and having lower solubility in simulated gastric and intestinal fluids, these are changed by transitional phases by melting, cooling and reheating. The new form of glibenclamide was obtained from the glassy state, by applying sublimation temperature at 130-160°C. New form of glibenclamide was characterized by DSC, FT-IR, SEM, hot-stage microscopy, PXRD and solubility studies.

Yumiko Kobayashi et. al., (2000) Developed polymorphs of carbamazepine and studied pseudopolymorphs (form I, form III and dihydrate) dissolution behaviors and bioavailability. The solubilities of both anhydrides (form I and form III), evaluated from the initial dissolution rate profile of each anhydrides were 1.5-1.6 times dihydrate.

Gamberini et. al., (2000) Prepared three different carbamazepine polymorphic forms. Polymorphism and pseudopolymorphism can give affect on bioavailability and effective clinical use. These prepared polymorphs characterized by FT-IR spectroscopy, XRPD, DSC, Hot Stage FT-IR thermomicroscopy. The obtained three different polymorphic forms are anhydrous carbamazepine: Form III, the commercial one, Form I.

Young-Taek Sohn et. al., (2000) Recognized physicochemical properties of drugs affected by the type of crystalline form of the drugs. Clarithromycin gave three polymorphic crystalline forms. New method involved to simple recrystallization of clarithromycin in different solvents like hexane, heptane
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or ethers, isopropyl ether. These polymorphs are compared by using DSC, XRPD with form II crystal prepared by conventional method. It indicated that improvement in the purity of the Clarithromycin polymorph form II crystal.

Robert E. Dinnebier et. al., (2000) Detected three crystalline modifications (A, B, and C) and these crystal structures were characterized by using single-crystal X-ray diffraction (pseudopolymorph C) and the method of simulated annealing from high-resolution X-ray powder diffraction data and IR.

Obtained crystal packing and the molecular conformation of telmisartan
Demonstrating the medium-sized (MW » 500) pharmaceutical compounds can now be solved quickly and routinely by using high-resolution X-ray powder diffraction data.

Martínez-Oharriz et. al., (1999) Investigated the physico-chemical characteristics of diflunisal-PEG 4000 solid dispersions prepared by melting, solvent and melting-solvent methods. Solvents are chloroform, methanol and ethanol-water. The drug present in different polymorphic forms. The characterization of solid dispersions was performed by X-ray powder diffraction. In solid systems obtained by the solvent and melting solvent methods and the drug solidifies in form III in ethanol / water and methanol, while polymorph IV crystallized in chloroform. In conclusion it revealed that changes in diflunisal polymorphic forms occurred during the formation of solid dispersion. Polymorphic form of drug determined by drug – polymer ratio and method of preparation.

Shivakumar et. al., (1999) Prepared different types of crystal and paracetamol crystals and the effect of solvents on the crystallization were characterized

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by using FT-IR, DSC and Powder XRD patterns. The results indicate that crystals prepared from different types of solvents exhibited different physicochemical properties. Desired physicochemical properties of crystals may be obtained by selecting the different types solvents by depending on the solubility profile of drug.

Y. E. Hammouda et. al., (1999) Reported sulphadiazine (SD) a suspension of the drug in a preselected solvent (5% aqueous ammonia solution) was stirred under controlled conditions. The solvent was subsequently removed and the material dried. The effect of experimental variables such as stirring speed and time, powder/ solvent ratio and inclusion of additives (Tween 80, sodium chloride and PVP) on the properties of solvent treated SD was assessed. Data obtained were compared with those for SD recrystallized under identical conditions. Solvent treatment of SD in the absence of additives resulted in a limited change in crystal morphology as indicated by SEM. This was associated with improved flowability and a limited reduction in dissolution rate relative to untreated SD. On the other hand, recrystallized SD exhibited superior flowability but a considerably low dissolution rate. Solvent treatment of SD in the presence of 2% PVP produced a microgranular directly compressible material.

Monica Bartolomei et. al., (1999) Prepared two forms of propranolol HCl and investigated the crystallization conditions and the physicochemical properties of the two polymorphs I and I. these are characterized by using FTIR spectroscopy, PXRD, thermal analysis, solubility and dissolution studies. Their stability test was followed at room temperature over a period of 1 year time and using under different conditions of temperature, grinding and <https://assignbuster.com/crystalline-modifications-and-solubility-of-prepared-crystal/>

compression to verify the capacity to solid-solid transition and to study the existence range of the two forms. These obtained results shown that form I was having less thermodynamically stable and more soluble and dissolved faster than crystalline form II.

Ranendra N. Saha, K. Venugopal, New, et. al., (2005) Developed for the estimation of Gatifloxacin in bulk and pharmaceutical formulations UV-spectrophotometric methods were used. Gatifloxacin was estimated at 286 nm in 100 mM phosphate buffer (pH 7. 4) and 292 nm in 100 mM hydrochloric acid (pH 1. 2). Linearity range was found to be 1-18 $\hat{1}\frac{1}{4}$ g ml-1, in the phosphate buffer (pH 7. 4) and 1-14 $\hat{1}\frac{1}{4}$ g ml-1 in hydrochloric acid medium (pH 1. 2). These methods were tested and validated for various parameters according to ICH guidelines and USP. These methods were successfully estimated for the determination of Gatifloxacin in pharmaceutical formulations.

Carolina B. Romanuk et. al., Reported two different types of polymorphic forms of new ciprofloxacin saccharinate. These two polymorphs were characterized and determine both polymorphic forms we used solid state techniques: powder X-ray diffraction, single crystal X-ray diffraction, Infrared and Solid State NMR.

V. Agafonov et. al., (1991) Developed single crystals of two polymorphic and four solvated crystalline forms of spironolactone from different types solvents. All crystal forms except for the one obtained from methanol, morphology, symmetry, and crystallographic parameters were determined. The stability of crystals and transformation of each type of crystal were

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characterized by using DSC, TGA, and X-ray diffraction analysis. It concludes molecules of spironolactone in the three different types of lattices.

Masato OHTA et. al., (1999) Investigated, heat of crystallization and heat of solution cefditoren pivoxil of different crystallinity were characterized by DSC and isothermal microcalorimetry, respectively. Cefditoren pivoxil heat of crystallization and heat of solution shown good linear correlation with the degree of crystallinity determined by Ruland's method by using powder X-ray diffractogram. The crystallinity changes of amorphous cefditoren pivoxil by adsorption of alcohol vapor could be evaluated for small quantity of sample by using of heat of crystallization. microcalorimetry was used to found prediction of dissolution behavior.

El-Sayed et. al., (1983) Developed four polymorphic forms of spironolactone. These crystal forms characterized by using melting point and aqueous solubility, IR, DTA, PXRD and powder dissolution. Prepared Crystals with ethyl acetate showed the lowest melting range and having highest dissolution, while prepared crystal from acetonitrile shown the highest melting range and shown low dissolution rate. Infrared spectra were not useful in clearly distinguishing between the different forms. DTA curves indicated that were different from the original form of the drug. X-ray patterns were different in intensities of radiation absorption and finally it confirming the presence of four different types of crystalline forms of spironolactone.

Robert E. Dinnebier et. al., (2000) Investigated Three crystalline forms A, B, and C of telmisartan and their polymorphs crystal structures characterized by single-crystal X-ray diffraction. Explanation of the crystal packing and the

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molecular conformation of medium-sized (MW $\hat{\%}^{\circ}$ 500) pharmaceutical ingredients can now be determined by high-resolution X-ray powder diffraction data.

J. M. Delgado et. al., (2007) Prepared several polymorphs of oxytetracycline hydrochloride under different conditions by crystallization: different conditions are slow evaporation, rapid crystallization, and vapour diffusion in different types of solvents. The solvents used included like water, ethanol, methanol, ether, ethyl acetate, toluene, dichloromethane and dioxane. The obtained different polymorphs products were characterized by X-Ray Powder Diffraction, NMR, FT-IR, and Thermal Analysis (TGA and DSC).

Biserka Cetina-Cizmek et. al., (2003) Developed piroxicam benzoate Solid-state properties and Investigated. piroxicam benzoate Samples were prepared by recrystallization from different types organic solvents (toluene, ethanol, methanol, ethyl acetate and acetone). Prepared samples were characterized by using FTIR, DSC, TGA, SEM and XRPD. DSC, TGA and XRPD. These are confirmed that piroxicam benzoate crystallized in two types of pseudopolymorphic forms A and B. Pseudopolymorphic form A was obtained by recrystallization in ethanol and methanol by slow cooling at ambient temperature and by rapid cooling in an ice-cold bath. Pseudopolymorphic form B was obtained by recrystallization from toluene by slow cooling at room temperature and also from toluene by rapid cooling in an ice cold bath.

Arvind K. Bansal et. al., (2003) Studied generation and characterization of various solid-state forms of celecoxib, The Celecoxib drug was subjected to polymorphic screen using various types of organic solvents to exhausts the

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possibility of existence of different solid forms. 1: 1 stoichiometric ratio of N, N-Dimethyl acetamide (DMA) and N, N-dimethyl formamide (DMF) gave solvates. Quench cooling of the melt resulted in amorphous form of the drug. All these solid-state forms were analyzed by thermoanalytical (DSC, TGA, HSM), crystallographic (XRD), microscopic (polarized, SEM), spectroscopic (FTIR), and elemental analysis techniques. Morphology Influences on flow behavior of different solid-state forms was also investigated.

Marcelo Antonio Oliveira et. al., (2010) Reported that the TGA and DSC are very useful for characterizing the drug and excipients stability. Verapamil hydrochloride shown thermal stability up to 180 °C and melts at 146 °C. Evaluated the Verapamil hydrochloride drug is compatible with all other excipients. The drug shown degradation when exposed to oxidizing conditions, that the degradation product resulting is 3, 4-dimethoxybenzoic acid derived from the alkyl side chain oxidation.

Alok Tripathi et. al., (2010) Developed ten crystalline polymorphic forms along with an amorphous form of Rabeprazole sodium. Polymorphism is gives solid physical properties they are influence on biological activity of drug, physiochemical properties of drug or substance industrial manufacturing method. Researchers attracted towards new polymorphic form of Rabeprazole sodium. Some polymorphic correlation parameters such as type of the solvent, , sequence of addition, temperature, volume of the solvent, rate of the agitation, pH of reaction mixture etc. showing effect on the polymorphism.

Kalinkova et. al., (1996) Investigated polymorphism of azlocillin sodium. Results of infrared spectroscopy, thermal analysis (combined thermogravimetry and differential analysis) and scanning electron microscopy confirmed recrystallization of lyophilized azlocillin sodium from simple solvent acetonitrile causes polymorphic transformation. New polymorph obtained by crystalline form.

C. Rodriguez-espinosa et. al., (1994) Investigated polymorphism crystal forms of I, II, and III forms and new crystal form (form IV) of diflunisal and these forms characterized by using powder X-ray diffractometry, DSC, hot-stage microscopy, IR spectroscopy, and dissolution studies. The mutual transition behavior of the prepared polymorphs was determined and the melting points and melting enthalpies were charac