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The impact of carbamazepine crystallinity on carbamazepine-loaded microparticle formulations
(2021) *International Journal of Pharmaceutics*, 602, art. no. 120638, .

DOI: 10.1016/j.ijpharm.2021.120638

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Abstract
Crystallinity plays a vital role in the pharmaceutical industry. It affects drug manufacturing, development processes, and the stability of pharmaceutical dosage forms. An objective of this study was to measure and analyze the carbamazepine (CBZ) crystallinity before and after formulation. Moreover, it intended to determine the extent to which the crystallinity of CBZ would affect the drug loading, the particle size, and the release of CBZ from the microparticles. The CBZ microparticles were prepared by encapsulating CBZ in ethyl cellulose (EC) polymer using a solvent evaporation method. EC was used here as a release modifier polymer and polyvinyl alcohol (PVA) as an aqueous phase stabilizer. Factorial design was used to prepare the CBZ microparticle formulations, including polymer concentration, solvent (dichloromethane, ethyl acetate), PVA concentrations factor, the homogenization time, and homogenization speed. The crystallinity of CBZ was calculated utilizing differential scanning calorimetry (DSC) thermal analysis. The crystallinity was calculated from the enthalpy of CBZ. Enthalpy was analyzed from the area under the curve peak of CBZ standard and CBZ-loaded microparticles. DSC and ATR-FTIR assessed the possible interaction between CBZ and excipients in the microparticle. The prepared CBZ microparticles showed various changes in the crystallinity rate of CBZ. The changes in the rate of CBZ crystallinity had different effects on the particle size, the drug loading, and the release of CBZ from the polymer. Statistically, all studied factors significantly affected the crystallinity of CBZ after formulation to microparticles. © 2021 Elsevier B.V.

Author Keywords
Carbamazepine; Crystallinity; Drug release; DSC; FTIR; Microparticles

Index Keywords
carbamazepine, excipient; differential scanning calorimetry, particle size, solubility; Calorimetry, Differential Scanning, Carbamazepine, Excipients, Particle Size, Solubility

Chemicals/CAS
carbamazepine, 298-46-4, 8047-84-5; Carbamazepine; Excipients

Funding details
PRGS19-005-0049
International Islamic University MalaysiaIIUMP-RIGS18-026-0026, RIGS16-114-0278
Funding details
This work was funded by the IIUM Research Initiative Grant Scheme (Grant Number. P-RIGS18-026-0026 and Grant no. RIGS16-114-0278) and Malaysian Ministry of Higher Education Prototype Research Grant Scheme (PRGS19-005-0049).

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Publisher: Elsevier B.V.

ISSN: 03785173
CODEN: IJPHD
PubMed ID: 33901596
Language of Original Document: English
Abbreviated Source Title: Int. J. Pharm.
2-s2.0-85105570565
Document Type: Article
Publication Stage: Final
Source: Scopus