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Influence of Carrier Properties on the Dissolution Behavior of Ibuprofen at different pH-values

M. Türk*, S. Reiser,

Karlsruhe Institute of Technology, 76131 Karlsruhe, Germany
* tuerk@kit.edu

The improvement of the bioavailability of orally applied drugs is one of the big challenges in pharmaceutical research. Especially drugs, which are highly permeable but poorly water-soluble (class II of the Biopharmaceutical Classification System, e.g. Ibuprofen) are in the focus. Their bioavailability depends on the velocity of dissolution and absorption. Particle size reduction is one suitable way to improve the dissolution of these drugs in the gastro intestinal tract. The controlled particle deposition process (CPD) [1] is a promising high-pressure process to prevent the disadvantages (broad particle size distribution, thermal or chemical degradation of the product etc.) of conventional particle size reduction processes. Solvent-free and ready-to-use products with controlled and improved dissolution properties are obtained by the CPD process [2].

In order to investigate the influence of the chemical nature of carrier materials on the dissolution behavior of Ibuprofen various carrier materials with different specific surface area, pore volume and diameter were used. Thereby, the impregnation of the carrier was performed at T = 313 K and p = 15 MPa and Ibuprofen loadings between 16 wt% and 50 wt% were reached. The dissolution behavior was measured at different pH-values (2.0 and 5.5) in an USP-II apparatus that is in compliance to FDA standards. The results of our experiments showed that the loaded carrier materials, compared to pure unprocessed Ibuprofen, have an improved dissolution behavior at pH 2.0 and 5.5. Furthermore, it was observed that large mesopores enhance the dissolution rate of Ibuprofen in aqueous media while the dissolution out of long and small channels is hampered. In addition, it is assumed that at low pH-values the dissolution rate of Ibuprofen is more affected by its crystalline state, whereas particle size becomes more important at higher pH-values.

[1] M. Türk, Particle Formation with Supercritical Fluids: Challenges and Limitations, 1st Edition (2014) Elsevier, Amsterdam, Print Book ISBN: 9780444594860
[2] S. Reiser, M. Sun, M. Johannsen, M. Türk, Influence of chemical nature of carrier materials on the dissolution behavior of racemic ibuprofen, J. Supercrit. Fluids, 132 (2018) 91–98