Anne M Juppo, J Pharm Drug Deliv Res 2018, Volume 7
DOI: 10.4172/2325-9604-C1-026

Nanocoating of drug powders and minitablets with atomic layer deposition

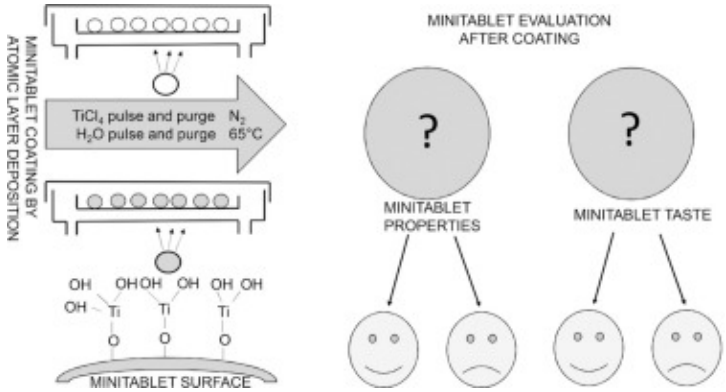
Anne M Juppo
University of Helsinki, Finland

Introduction: Atomic Layer Deposition (ALD) coatings in microelectronical applications have been described to form continuous, ultra-thin, dense and pinhole-free layers on substrates, and to be able to fill the deepest voids and pores. Recently, ALD has been used in the design of nanoparticles, and larger-sized, single drug powder particle applications, as well as on tablet formulations. However, the feasibility of ALD on heterogeneous and porous tablet surfaces is still relatively unknown. Therefore, the feasibility of ALD was studied in minitablet coating with the focus on taste masking efficacy. Further, the effect of nanocoating on the dissolution behaviour of drug powder particles was investigated.

Methodology: ALD on minitablets was performed in a stationary laboratory-scale flow type ALD reactor. The thin nanolayers of TiO_2 were grown on minitablets with three different numbers of cycles. Nanocoated acetaminophen and indomethacin powders were prepared in a rotary pump reactor through static exposure pulses creating TiO_2 and ZnO coatings with three different numbers of cycles. The dissolution of the drug from the powder particles and flowability of uncoated and nanocoated powders were investigated. The dissolution of bitter substance from coated minitablets was investigated. Scanning Electron Microscopy with Energy Dispersive Spectroscopy (SEM-EDS) was used to characterize their nanocoating.

Findings: Nanocoating of drug powders improved the flow rate, as expected. The ALD coating thickness also correlated with the drug dissolution rate of nanocoated indomethacin. On studied levels of deposition conditions, the method was not considered adequate for minitablet taste masking. Surface content analysis revealed that deposition of coating was inhomogenous.

Conclusions & Significance: Even if nanocoating with ALD was successful for both powders and tablets, ALD is a technology that cannot be applied to pharmaceuticals without further studies on other precursor materials and larger number of cycles. It appears to be more feasible for coating of powder particles than for porous organic substrates like minitablets.



Biography

Anne M Juppo holds a Professorship in Industrial Pharmacy at University of Helsinki since 2006. Previously, she has worked in Pharmaceutical R&D in Orion, Finland and AstraZeneca, Sweden for 13 years. Her research at the University of Helsinki is focused on the novel technologies (excipients and processes) for pharmaceutical solid formulations on biopharmaceuticals and solid formulations for veterinary, pediatric and elderly patients..

anne.juppo@helsinki.fi