

Influence of Storage Humidity and Powder Fill Level on Charging Behaviour of Different Capsules Types

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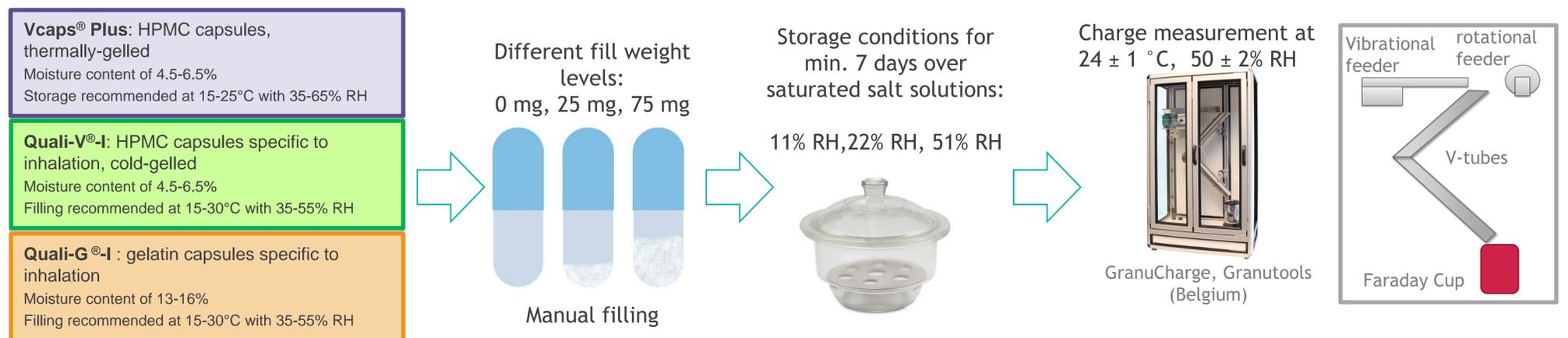
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Introduction

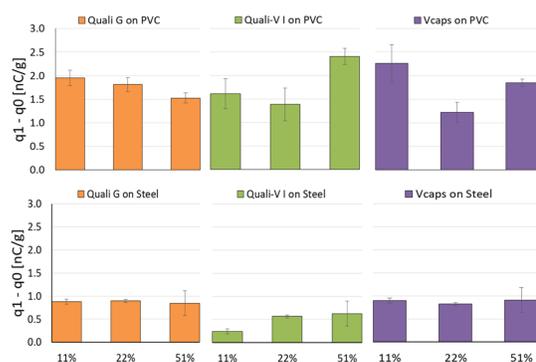
In dry powder inhalers (DPIs), tribo-charging can cause problems in terms of mixing homogeneity and dosing accuracy. Further, it can lead to particle adherence on surfaces and agglomeration of particles during manufacturing or powder release from the capsule. Therefore, this study was designed to explore triboelectric effects during capsule filling for DPI formulations. Specifically, the influence of storage humidity conditions and powder fill level of HPMC and gelatin capsules on their electrostatic behaviour was investigated.

Material and Methods

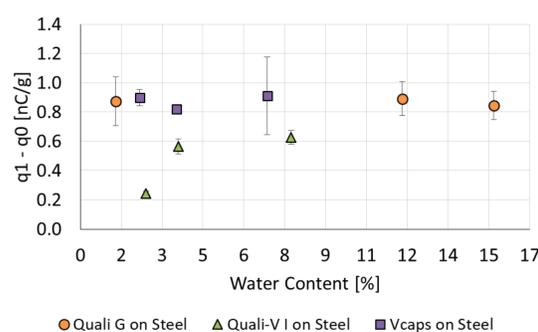


Results and Discussion

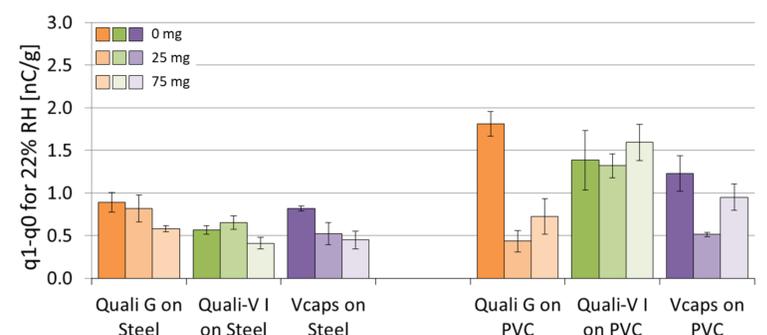
- Initial charge of all capsules (q_0) was negative in the range of -0.25 to -0.12 nC/g
- For all capsules net charge to mass ratio was positive ($q_1 - q_0$) after transport over both materials
- Higher charging of capsules on PVC due to the insulating properties of PVC
- Storage humidity \uparrow \rightarrow Charge of Quali-G and Vcaps Plus tends to decrease over PVC
- Storage humidity \uparrow \rightarrow Charge of Quali-V I tends to increase on steel and PVC
- Quali-G and Vcaps Plus show similar charging tendencies concerning capsule water content
- Except for Quali-V I capsules on PVC, capsule fill level decreases charging tendencies



Charging of capsules on PVC and stainless steel



Charging tendency as function of water content



Charging tendency of capsules filled with 0, 25 and 75 mg powder blend

Outlook

Different chemical treatment in the gelling procedure of HPMC capsules could lead to different orientation of functional groups within the surface structure. Therefore, the type of manufacturing and/or the external lubricant can have an impact on the charging behaviour. The study will be extended on different lubrication types and levels on gelatin and HPMC capsules.