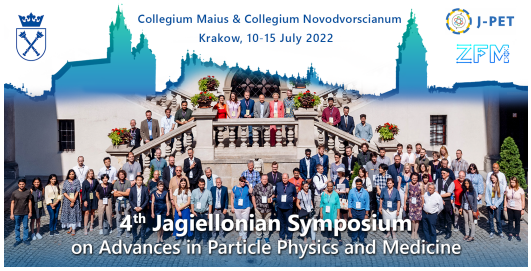

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Mesoporous silica carriers for controlled drug release

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One of the most important challenges in modern medicine is to ensure the desired course of delivery of active pharmaceutical ingredients (APIs) to the patient's body. Therefore, many studies are devoted to new delivery systems that can control both rate and period of drug delivery as well as the place of their administration. An important factor to consider when designing controlled release systems is the solubility of the API in the aqueous environment. Using an appropriately designed carrier allows to control the infiltration of the dissolving medium into the system, resulting in a modification of the release of API. Among others, the carriers suitable for achieving this goal are porous matrices, in which a solid dispersion of the drug is formed.
The ordered mesoporous silica SBA-15 (carrier) and diclofenac sodium (API) were used to develop a controlled drug release system. The release rate of diclofenac sodium was tested in vitro to evaluate the suitability of this system for API release control. For tabletted SBA-15, it was possible to achieve a release course close to the desired linear release profile with release of about 50% API after 24 hours.
Further improvement of the release system requires insight into the course of API release through its detailed study. The distributions of diclofenac sodium within the carrier were studied for systems before release and after various release times. Scanning electron microscopy (SEM) coupled with energy dispersive spectroscopy (EDS) was used to determine the morphology and the spatial distribution of the elements. Free volumes ranging in size from angstroms to nanometers were characterized with nitrogen adsorption and positron annihilation lifetime spectroscopy (PALS). The results obtained with these techniques allow to infer how the microstructure of the carrier-API system influences the drug release.

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