

# Development of transdermal drug delivery systems of cosmetic ingredients using metal-organic framework

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A spray-dried cyclodextrin-based metal-organic framework (CD-MOF) with tunable physicochemical properties, such as crystallinity, porosity, and dissolution properties, was fabricated. The spray-drying precursor properties, including ethanol volume ratio, incubation time, and precursor concentration, were optimized for controlled crystallization. The spray-dried CD-MOF products exhibited various physicochemical properties in terms of morphology, X-ray diffraction (XRD) peak intensity, and specific surface area. Thus, amorphous, partially crystalline, and highly crystalline spray-dried CD-MOFs were identified. By introducing ketoconazole (KCZ) to the precursor, the surface area of the CD-MOF product was enhanced compared with that of the plain CD-MOF prepared using the same parameters. The presence of KCZ in the hydrophobic cavity between the two  $\gamma$ -CD molecules may facilitate CD-MOF crystal growth. As determined by the dissolution test, the CD-MOF particles exhibited different dissolution behaviors, which is attributed to the position of KCZ. Regarding flexibility, the design of tunable spray-dried CD-MOFs may contribute to various research fields. The spray-dried CD-MOF including drugs could be applied to the transdermal drug delivery systems of cosmetic ingredients.