

## X-RAY MICROSCOPY

# X4 POSEIDON – Nifedipine controlled-release tablet

## Application Report 9

Nifedipine is a calcium channel blocker primarily used to treat hypertension and angina. It works by inhibiting the entry of calcium ions into the cells of the heart and smooth muscles, which leads to vasodilation, reducing blood pressure and the heart's workload. The controlled-release form of Nifedipine is designed to release the drug slowly over time, ensuring a stable blood concentration, improving therapeutic efficacy, and reducing side effects.

These formulations often use specific technologies like polymer coatings or osmotic pumps to control the drug's release rate. By avoiding rapid absorption and metabolism, this approach helps prevent the adverse effects associated with peak drug concentrations.

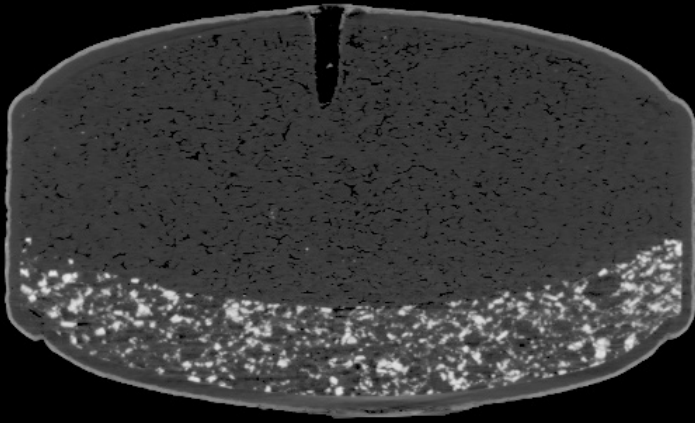
In the research of controlled-release tablets, XRM is beneficial in several key areas:

**Monitoring Drug Distribution and Release Behavior:** XRM can visualize how the drug is distributed within the tablet and how it is released over time. For controlled-release formulations, understanding the release dynamics is crucial to optimizing the drug's therapeutic profile.

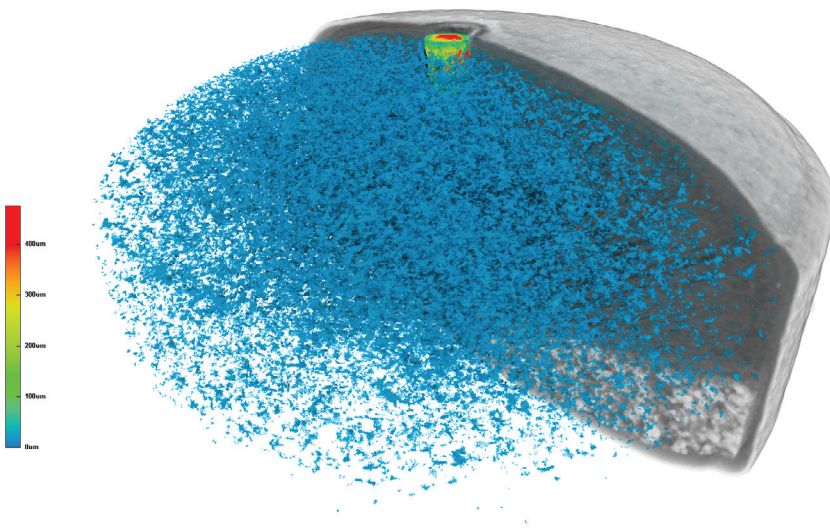
**Analysis of Tablet Structure and Porosity:** XRM provides detailed information about the internal structure of the controlled-release tablet, including its porosity, membrane uniformity, and the shape of the drug carrier. These structural features play a vital role in the release rate of the drug, and XRM can help researchers optimize these characteristics for better performance.

The X4 POSEIDON microCT imaging workstation is a 3D imaging core facility on your desktop. The following settings were used for this study:

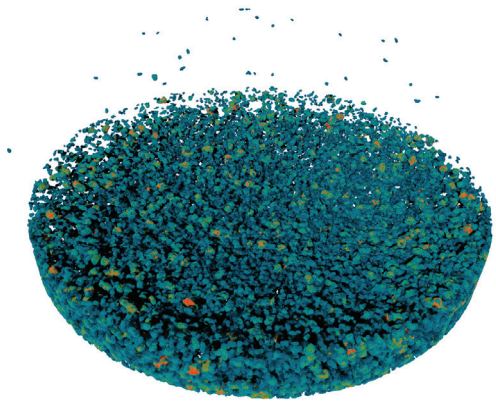
- 7 Mpixel Flat-panel X-ray camera
- 45 kV, 100  $\mu$ A
- Scan duration: 22 min
- Voxel resolution: 4.5  $\mu$ m



**Figure 1**  
Orthogonal slice through the tablet.



**Figure 2**  
Pore size distribution inside the tablet.



**Figure 3**  
Particle size distribution of high-density particles inside the tablet.

**Comparing Different Formulations:**

Different formulations (such as various polymers or excipients used in the tablet) can significantly affect the release characteristics. XRM can help identify the impact of these changes on drug release, enabling researchers to refine and improve the formulation.

**Ensuring Drug Stability and Quality**

**Control:** XRM can detect structural defects in the tablet, such as cracks or voids, which may affect drug release and stability. By ensuring the integrity of the tablet structure, XRM helps maintain the quality and effectiveness of the drug during production, storage, and use.

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