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Balancing laser marking efficiency and enteric film coated tablets integrity

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Laser-based QR code marking directly onto oral solid dosage forms (OSDFs) provides a package of benefits in the healthcare sector. This study applied an ultrafast Ti:sapphire laser to mark traceable QR codes on enteric film-coated tablets, supplementing package-level serialization for anti-counterfeiting.

Ibuprofen tablets underwent direct compression followed by dual-layer film coating. The inner layer was a gastro-resistant formulation (Acryl-EZE® MP, Colorcon, Hungary), and the outer layer was an immediate-release, colored coating (Opadry®, Colorcon, Hungary). QR codes were engraved on the tablet surfaces via laser ablation using varied parameters (e.g., pulse number and laser energy). Post-processing, the tablets were characterized to assess changes in their functional performance.

Marking achieved sufficient speed, precision, and capacity for small batches. In addition, the readability of QR code depended strongly on laser parameters and coating types. By optimizing laser settings and coating thickness, selective ablation of the outer layer was achieved while preserving the integrity and functionality of the gastro-resistant coating. These findings have been confirmed by *in vitro* dissolution test, scanning electron microscopy measurements, and Raman spectrometry where no chemical decomposition of drug or even the tablet core was detected.

In conclusion, ultrafast Ti:sapphire laser marking holds promise for OSDF design. However, careful consideration of formulation and processing conditions before application is required, particularly when talking about modified-release tablets.

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