

Flash NanoPrecipitation (FNP) – Principles and Applications in Medical Imaging and Drug Delivery

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Flash NanoPrecipitation (FNP) is a rapidly evolving technique that allows for the scalable production of nanoparticles, making it a valuable method for various applications, including drug delivery and medical imaging. Initially described in 2003¹, FNP utilizes a turbulent mixing process to generate highly loaded nanoparticles by combining a hydrophobic active molecule with an amphiphilic polymer in a water-miscible organic solvent². The ability to control nanoparticle size through the active-to-polymer ratio and the scalability of the mixing process², as demonstrated by advancements from confined impinging jet (CIJ) mixers to multi-inlet vortex mixers (MIVM), positions FNP as a versatile platform for both small-scale laboratory research and large-scale commercial production.

The effectiveness of FNP in encapsulating a wide range of active pharmaceutical ingredients (APIs), including hydrophobic and hydrophilic compounds, underscores its potential for enhancing bioavailability and therapeutic efficacy. With applications ranging from oral drug formulations to targeted imaging agents, FNP is not only a promising approach for researchers but also offers a straightforward pathway for translating laboratory findings into practical, scalable solutions in nanomedicine. As the technology continues to evolve, it is expected to drive further innovations in nanoparticle-based therapies and diagnostics, warranting consideration by researchers in the field.

References:

¹ Johnson BK, Prud'homme RK.; Aust. J. Chem. 2003, 56(10):1021.

² Pagels RF, Edelstein J, Tang C, Prud'homme RK.; Nano Lett. 2018, 18(2):1139-1144.