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UHPLC System Shutdown and Reactivation Advice

UHPLC 시스템 종료 및 재가동 시 가이드

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Abstract

Ultra-high performance liquid chromatography (UHPLC) systems are integral to modern analytical laboratories, necessitating careful maintenance and operation protocols to ensure optimal performance. This document provides comprehensive guidelines for the proper shutdown and reactivation of UHPLC systems to prevent damage and maintain operational efficiency.

- Shutdown: Remove the column and replace it with a union to avoid blockages. Flush the system with a compatible solvent mix, clean mobile phase reservoirs to prevent microbial growth, flush the pump with storage solvent, and clean the autosampler, including the needle and injection port.

- Reactivation: Inspect the system for wear or damage, gradually reintroduce mobile phases starting with a weak solvent, reinstall the column securely, and perform system checks on baseline stability, pressure consistency, and detector performance.

By adhering to these guidelines, laboratories can ensure the longevity and reliability of their UHPLC systems, maintaining high analytical performance and minimizing downtime. These procedures help prevent common issues such as blockages, contamination, and component wear, thereby supporting efficient and accurate analytical operations.

Keywords

UHPLC, Ultra-high performance liquid chromatography system, Chromatography, System shutdown, System maintenance, UHPLC system reactivation procedure, Column reinstallation

Chromatography Solutions

LC Tips #003

U/HPLC System Shutdown & Reactivation Advice

INTRODUCTION

Before any extended period of inactivity, it is important to follow the appropriate shutdown procedure to prevent damage to the LC system. This limits the potential for aggressive mobile phase constituents to corrode system components and also eliminates the risk of microbial growth. Similarly, following an appropriate start-up protocol, after a period of system inactivity or storage, will ensure the system is fit for purpose and help avoid unnecessary system downtime.

SYSTEM SHUTDOWN PROCEDURE

The following steps should be considered:

1. Clean and store the column as recommended by the manufacturer; the storage solvent is usually specified on the column QC certificate. An example column cleaning procedure can be found in Avantor ACE Knowledge Note AKN0004.
2. Replace the column with a zero dead volume (ZDV) connector.
3. Flush the system at a low flow (generally half the normal flow rate employed) with the current solvents and method to remove any sample remaining on the system.
4. If the system has been used with buffer solutions, replace the buffer bottle with pure HPLC grade water and purge the channel for 5 minutes. Flush the entire system for at least 30 minutes to fully remove buffer salts.
5. If aggressive organic media has been used, replace the solvent bottle with a non-aggressive organic solvent (e.g. ethanol, methanol, IPA) and purge the channel for 5 minutes. Flush the entire system for at least 30 minutes.
6. Mix a 50:50 solution of water/organic solvent (e.g. methanol, ethanol, IPA) and insert all solvent and wash solution lines. Purge all channels for at least 5 minutes and then flush the entire system for at least 30 minutes. Ensure the autosampler needle is also flushed with this 50:50 solution.
7. Turn off the power to all modules in the system and empty the waste container.

SYSTEM REACTIVATION

1. Install a ZDV connector, replacing any column present in the system.
2. Turn on the power to all modules in the system. **Do not** turn on the detector lamp if the room is cold.
3. *Prepare a new cleaning solution of 50:50 water/organic solvent (e.g. methanol, ethanol, IPA) and insert all solvent and wash solution lines. Prime/purge all channels for at least 5 minutes and then flush the entire system for at least 30 minutes.
4. Check to see if the needle wash and seal wash need replacing.
5. Check system performance and autosampler accuracy by performing a minimum of six injections of caffeine, paraben or acetone, or other system suitability standard, and check %RSD values for peak area and retention time.

*If the system was not shut down in the manner described on page 1, then it may be necessary to additionally perform steps 3-5 from the shutdown procedure.

RECOMMENDATIONS

If the system has been shutdown for an extended period, the following additional checks can be made:

1. Perform leak test/valve test.
2. Perform pressure test - verify system pressure is consistent with pressure readings from before system shutdown and that no pressure fluctuations are observed.
3. Perform oven temperature accuracy test.
4. Check flow rate accuracy.
5. Measure dwell volume and dispersion (see Avantor ACE Knowledge Notes AKN0001 and AKN0017)
6. Perform detector lamp intensity test and check baseline for low noise and drift.
7. Check detector cell cleanliness by performing an intensity test (refer to LC system user manual).

These tests (including step 5 from System Reactivation) can also be performed at any time to check instrument function and performance. It is recommended to perform these tests annually and keep a record of the results.