

Healthcare & Analytical Systems

Connective Industries

#Healthcare, QoL #Productivity Improvement #IoT/Data Utilization #Measurement & Analytical Systems

1. Hitachi Automatic Analyzer 3500 with automatic cross-mixing function for acquired hemophilia diagnosis

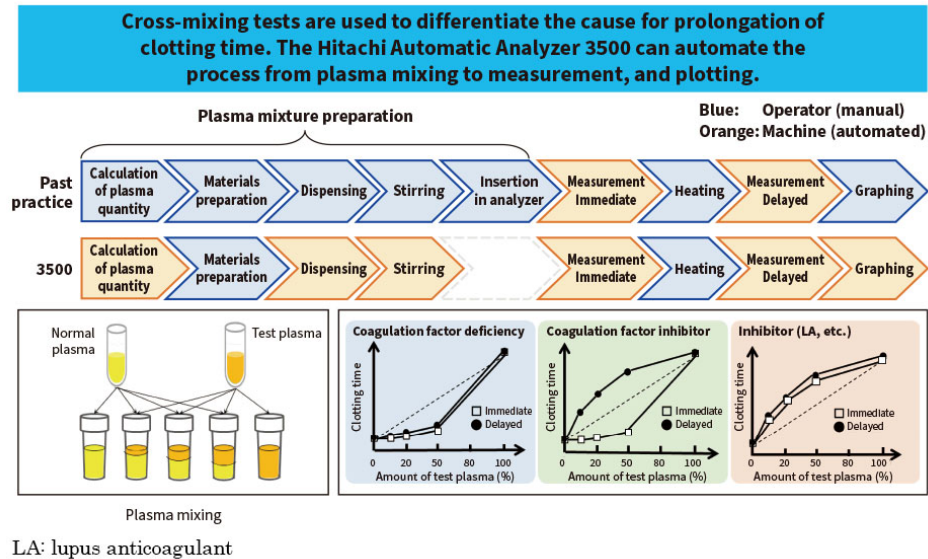
Cross-mixing tests can be used in clinical testing as a screening method to distinguish between cases of prolongation of clotting time that are caused by a lack of the coagulation factor needed for coagulation and those that are caused by the presence of substances that inhibit coagulation. This provides a way to diagnose acquired hemophilia, a condition that is designated as an intractable illness in Japan (where the test is authorized for insurance coverage). Unfortunately, hospitals find the test difficult to perform in-hospital as preparing the two types of blood plasma (normal and test plasmas) in seven different mixing ratios, performing the measurements, and plotting the graphs are complicated and time-consuming tasks for the laboratory technician.

In response, the automatic cross-mixing function provided on the Hitachi Automatic Analyzer 3500 has automated preparation of the plasma mixtures and all of the steps from initial measurement to graph output.

The Hitachi Automatic Analyzer 3500 is a multi-purpose system that combines a range of measurement functions in a single machine, including biochemistry and coagulation testing. In addition to its ability to suit the use of testing laboratories, the analyzer is also helping to shorten turnaround time by cross-mixing tests conducted in-hospital, something that was difficult to perform in the past due to the complicated and time-consuming nature of the test.

(Hitachi High-Tech Corporation)

[01] Hitachi Automatic Analyzer 3500 with cross-mixing function that helps to reduce the laboratory technician's workload



2. Vitro Detector for Non-invasive Observation of Liquid Samples by Electron Microscope

Many products are manufactured in liquid form, ranging from electronic materials to foodstuffs. While it is conventional practice to use material shape and size for quality management at the raw materials stage, demands for ever higher levels of reliability are making it more important than ever to determine the distribution and phase composition of nano-scale particles in liquids.

The main technique for observing liquid samples using an electron microscope involves encapsulating the sample liquid within a barrier such as a silicon nitride film. Observation is then performed using a high-energy electron beam powerful enough to penetrate this barrier together with a detector for back-scattered or transmitted electrons. Unfortunately, the imaging of low-atomic-weight elements and electron beam damage pose problems when using this approach.

The Vitro detector uses permittivity-based microscopy for non-invasive observation without exposing the sample to the electron beam. Signal detection uses the electron-hole pair current generated in the silicon nitride film, building an image from the differences in permittivity in the liquid sample. By doing it this way, it is possible to capture high-contrast observations without causing damage to low-atomic-weight materials that have proved difficult to observe in the past, such as biological samples or organic substances in solution. Potential uses include determining the distribution of microparticles in a slurry. The Vitro detector uses a signal detection technique that was jointly developed with the National Institute of Advanced Industrial Science and Technology and can be fitted to the SU5000 Schottky scanning electron microscope.

(Hitachi High-Tech Corporation)

3. ZA4000 Series Polarized Zeeman Atomic Absorption Spectrophotometer

Atomic absorption spectrophotometers are used for the quantitative analysis of minute quantities of metals in solution. Applications include quality management and compliance with environmental regulations in industries such as materials, chemicals, environment, food, and pharmaceuticals.

Hitachi supplies the ZA4000 series of polarized Zeeman atomic absorption spectrophotometers, which now includes a sequential flame type that uses a newly added gear drive mechanism for the diffraction grating to adjust the measurement wavelength, thereby enabling sequential measurement of multiple elements.

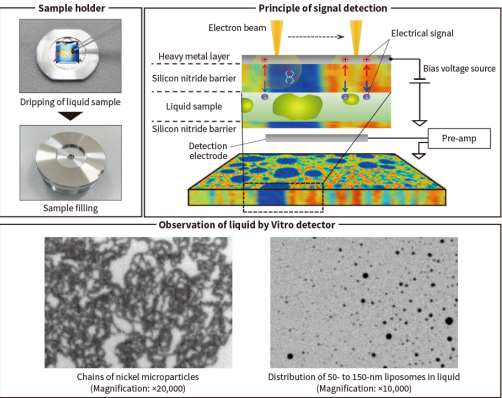
The main features are as follows.

- (1) The new ZA4800 is a rapid sequential flame type and joins an existing product lineup comprised of the ZA4000 (Tandem [Flame and Graphite Furnace] type AAS), ZA4300 (Flame type AAS), and ZA4700 (Graphite Furnace type AAS)
- (2) Precise and high-speed measurement using the rapid sequential feature (with a measurement time approximately 30% faster than dedicated flame model)
- (3) Powerful support for users engaged in analysis. The system combines precise and highly sensitive hardware using polarized Zeeman correction and dual detection with user friendly software that includes a trace-quality analysis and diagnostic system and a sample table read function.

(Hitachi High-Tech Science Corporation)

4. NEXTA DMA Dynamic Mechanical Analyzer

[02] Vitro detector



[03] ZA4000 polarized Zeeman atomic absorption spectrophotometer



Dynamic mechanical analyzers determine the viscoelastic properties of materials by measuring the strain when they are placed under load while being heated or cooled. The required measurement range for elastic modulus has increased over recent years as users such as the automotive and electronics industries have adopted materials with more diverse properties.

Capable of double the load of the previous model while still maintaining high accuracy in low-load measurements, the NEXTA DMA can perform elastic modulus measurements for a wide range of materials, from carbon-fiber-reinforced plastics and other high-elasticity materials through to low-elasticity materials such as functional plastics used in electronics. Safety and ease-of-use have been enhanced by support for electrical gas cooling that does not require liquid nitrogen. A camera function has also been added for the real-time observation and recording of the material under test. This allows for multipurpose testing that looks at things like shape or color changes as well as viscoelastic properties.

In the future, Hitachi intends to continue supplying analyzers that support customers engaged in activities ranging from the research of advanced materials to quality management in a wide range of industries.

(Hitachi High-Tech Science Corporation)

[04] NEXTA DMA dynamic mechanical analyzer



5. Deployment of Particle Beam Therapy System in Asia

Hitachi has put a lot of effort into the deployment of its particle therapy systems not only in Japan, but also in overseas markets such as the USA. In 2023, three of these systems commenced operation in Asia, the first for Hitachi in this region.

Taiwan's first heavy-ion therapy system was supplied to Taipei Veterans General Hospital and commenced operation in May 2023.

The system is equipped with two therapy rooms capable of delivering heavy-ion beam both horizontally and vertically. It was the first heavy-ion therapy system to be supplied by Hitachi outside Japan. Similarly, Hong Kong's first proton therapy system was supplied by Hitachi to Hong Kong Sanatorium & Hospital and commenced operation in July 2023. The system has two rooms with rotating gantries. This was followed in August by a proton therapy system with four rotating gantry rooms and one fixed beam room at National Cancer Centre Singapore. All of these systems are equipped with real-time image gating system to treat tumors in motion due to respiration and advanced spot scanning technology.

[05] Treatment room of proton therapy system



Hitachi Review

Hitachi Review is a technical medium that reports on Hitachi's use of innovation to address the challenges facing society.

The *Hitachi Review* website contains technical papers written by Hitachi engineers and researchers, special articles such as discussions or interviews, and back numbers.

Hitachi Hyoron
(Japanese) website

<https://www.hitachihyoron.com/jp/>



Hitachi Review
(English) website

<https://www.hitachihyoron.com/rev/>



Hitachi Review Newsletter

Hitachi Review newsletter delivers the latest information about Hitachi Review when new articles are released.