Microwave-Assisted Freeze Substitution of Biological and Biomedical Samples (MWFS)

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Technology description

Freeze substitution fixation (FS) of hydrated samples frozen in vitreous ice provides exceptional preservation of structure for light and electron microscopy, and enables immunological detection of thermo-labile antigens that otherwise are damaged/destroyed by processing at ambient or elevated temperatures. Its use as a research tool or in clinical pathology has, however, been limited by the relatively lengthy periods required for passive diffusion of fixatives and organic solvents into the frozen hydrated material.
The instant invention utilizes controlled microwave (MW) irradiation to accelerate the FS process; and comprises systems, devices and methods for microwave-assisted processing of samples under cryo-conditions. The entire MWFS procedure has been accomplished in less than 4 hours as compared to the approximately 2-5 days required for FS.

Application area

Provides superior preservation and rapid turnaround in research and high throughput clinical laboratory settings
Applicable to a broad range of biological samples, hydrogels, and other hydrated materials
Processing for light and electron microscopy
Low-temperature synthetic and analytical chemistry

Advantages

Reduces processing periods from days to hours
Improves preservation, approaching native state
Enables uncomplicated, programmable operation
Provides excellent reproducibility

Institution

NIH - National Institutes of Health

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