WINNER

1997 R&D 100 Awards Winner

Rapid Size Analysis of Individual DNA Fragments

Features

Our analytical technique measures the size of individual DNA fragments by means of a derivative of flow cytometry. Analysis rates approaching 100 fragments per second allow enough data to be collected in 3 minutes to accurately determine the DNA fragment size distribution in a sample. Although capable of measuring fragments as small as 212 base pairs, the technique is best suited to analyzing fragments greater than 10,000 base pairs in length.

Applications

Our technology will find applications in both research and clinical laboratories for

- identifying bacterial strains in epidemiological studies determining antibiotic resistance
- detecting mutations
- controlling the quality of large insert clone libraries for human genome studies
- analyzing restriction fragments
- characterizing polymerase chain reaction (PCR) products

Benefits

The benefits of our technology over existing analytical techniques are in

- measurement speed (3 minutes versus 20 hours)
- accuracy (2% versus 10%)
- linear response (versus compressed migration in electrophoresis)
- resolution (equals that of electrophoresis in the range of 20,000 to 30,000 base pairs and is greater for larger fragments)
- sample size (picograms versus micrograms)
- quantitative analysis (provides direct counts of fragments versus an indirect measurement based on calibration)

- independence from DNA conformation (measures both linear and circular DNA)
- Differentiates ASR from other causes of degradation with ASR-specific reagents
- Eliminates need for special equipment and extensive training
- Diagnoses ASR deterioration in time for remediation that forestalls structural repairs or replacements
- Reveals proximity of ASR to different aggregate components
- Avoids the radioactive materials of other diagnostic methods
- Provides reliable diagnosis in less than five minutes for less than $1 per concrete sample

Applications

- Analyzing the integrity of concrete in structures such as highways, bridges, dams, railroad ties, and culverts on the site
- Finding ASR before structures are irreparably damaged
- Identifying aggregate components triggering ASR
- Evaluating concrete mix designs for ASR potential
- Expanding studies of all factors associated with ASR's occurrence

Benefits

- Allows many structures to be tested quickly
- Opens the door to discovering and eliminating widespread degradation in the nation's infrastructure
- Eliminates expensive repairs and replacements by identifying ASR early enough for remediation
- Enables research into improved concrete mixes and better remediation treatments
- Supports efforts to develop ASR-free concrete for the future