Research Capabilities Pertinent to SHALE GAS

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Outline

- Nano Characterization of Materials
- Ultrasonic Sensors for harsh Environments
- Novel processing technologies
Nano-Characterization Capabilities

Technologies
• Scanning Acoustic Microscope (SAM)
  – Grain Structure
  – Porosity
  – Sub-surface feature
• Atomic Force Microscopy
  – Nano-image
  – Nano-mechanics

Applications
• Gas Exploration
  – Analysis of core samples and drill cuttings
  – Nano-Porosity Indicates
    • Productivity
    • Drilling and Completions Program
• Drilling Fluid and Cement Additives
  – Analysis of novel nano and micro scale additives
Ultrasonic Sensor Applications

- Robust ultrasonic sensors enhance measurement capabilities
  - In-situ monitoring of critical components
    - Bit wear, piping, joints,
  - Production Logging
    - Down-hole Fluid properties, flow-rates, pressures, cutting sizing
  - Well Inspection and Geophysical Bore hole logging
    - Bottom hole porosity and mechanical properties
Novel Processing Technology

Multi-Energy Technology

- Utilizes Microwaves and High Intensity Ultrasound
  - Ability to selectively heat target molecules
  - Fast Reactions
  - Reduced chemical requirements
  - Improved extractions

Shale Gas Applications

- “Green” process for water recovery/treatment
- Enhance extraction and recovery (well stim)
- Rapid emulsifying of specialty slurries
Recent Projects

- Acoustic sensors for micro-seismicity to detect cracks in composites during high pressure molding.
- High Intensity Ultrasound to enhance mixing fluids (oil and alcohol).
- Ultrasonic interrogation through steel walls to detect fluid-level and type.
- Ultrasonic evaluation of fluids to measure viscosity, chemical composition.