

Research Capabilities Pertinent to SHALE GAS

Dr. B.,R Tittmann

Engineering Nano-Characterization Center
Department of Engineering Science and Mechanics
The Pennsylvania State University

212 Earth and Engineering Sciences Building
University Park, Pennsylvania 16802
brt4@psu.edu



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