HIGHWAY MATERIALS

Part 4

Bitumen

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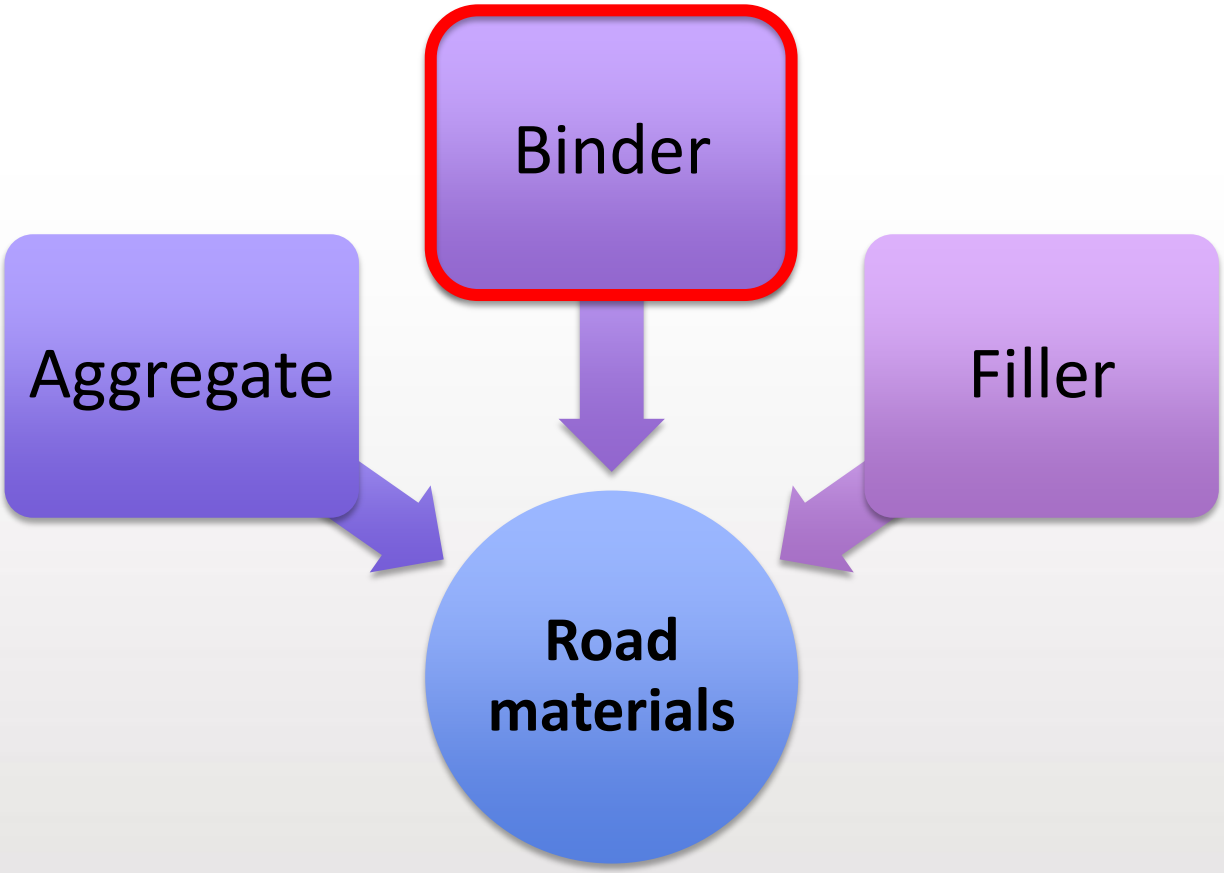
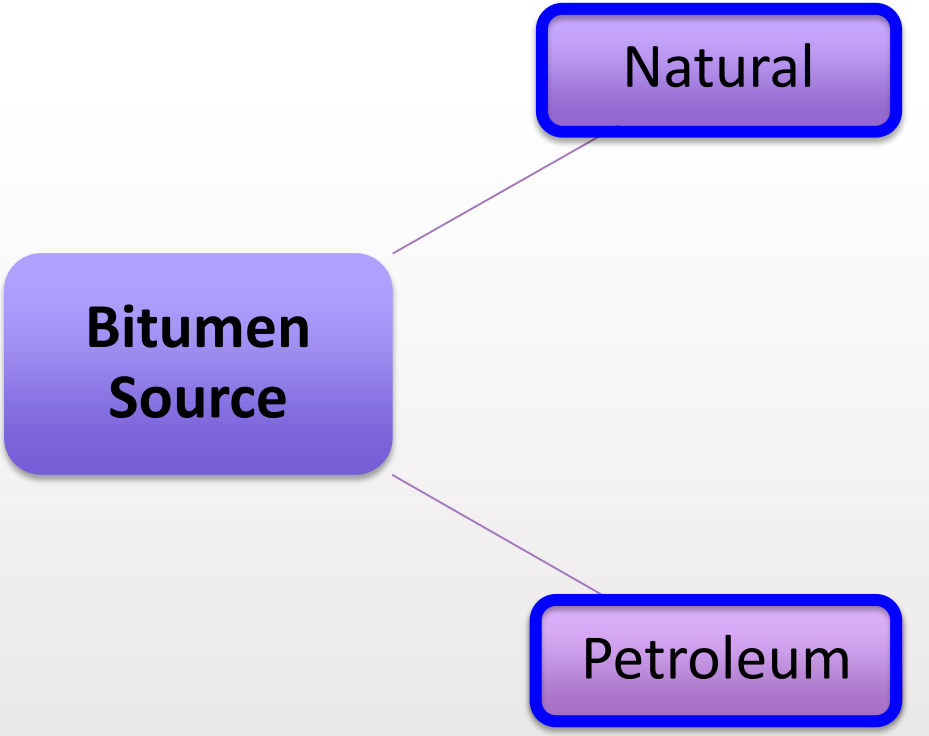

Binder
Aggregate
Filler
Road materials

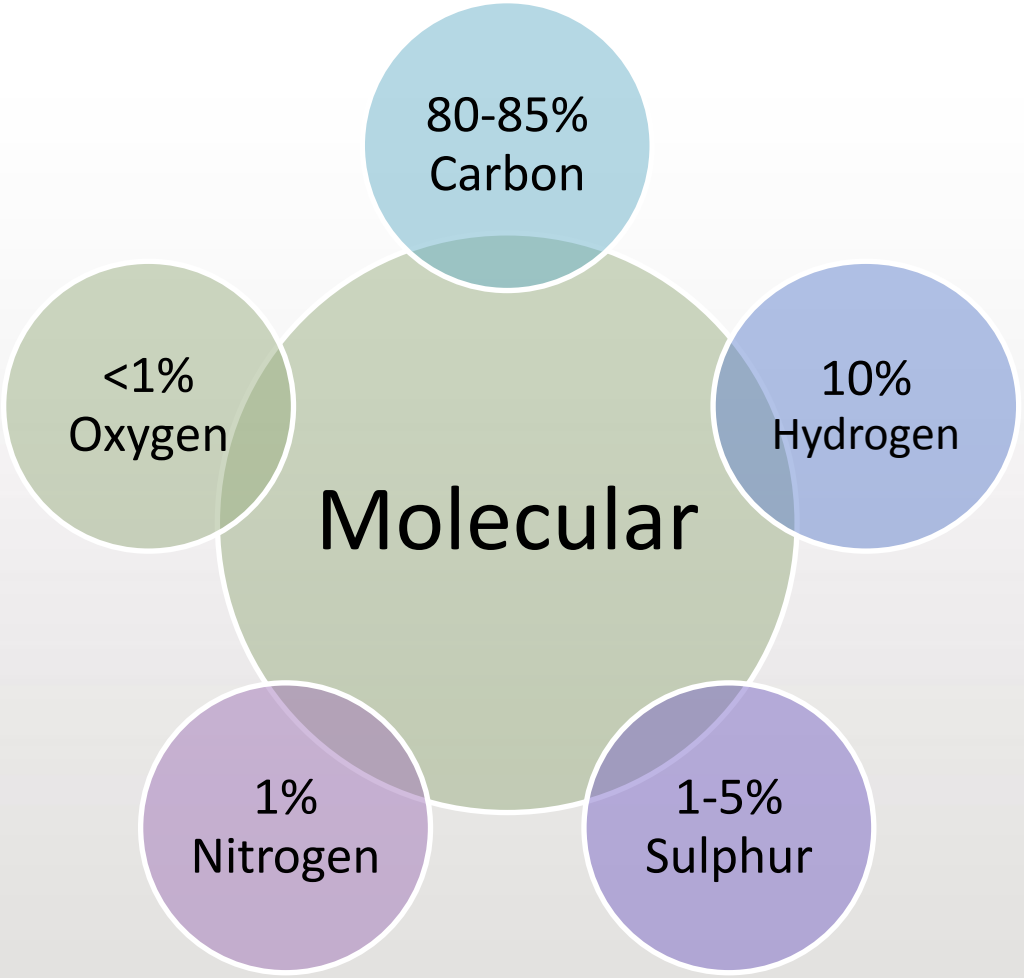
Content

- ✓Origin and Production
- ✓Composition and Types of Bitumen
- ✓Bitumen Properties
- ✓Grading Systems
- ✓Tests on Bitumen Properties

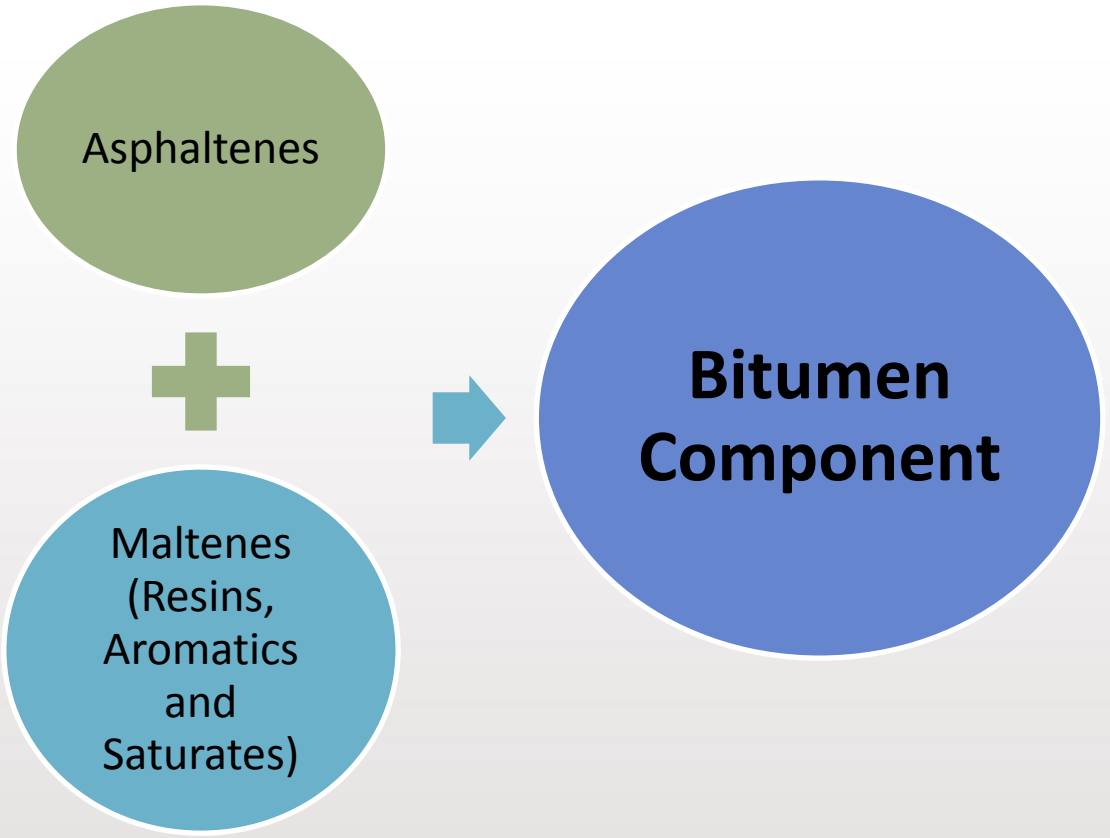
Origin

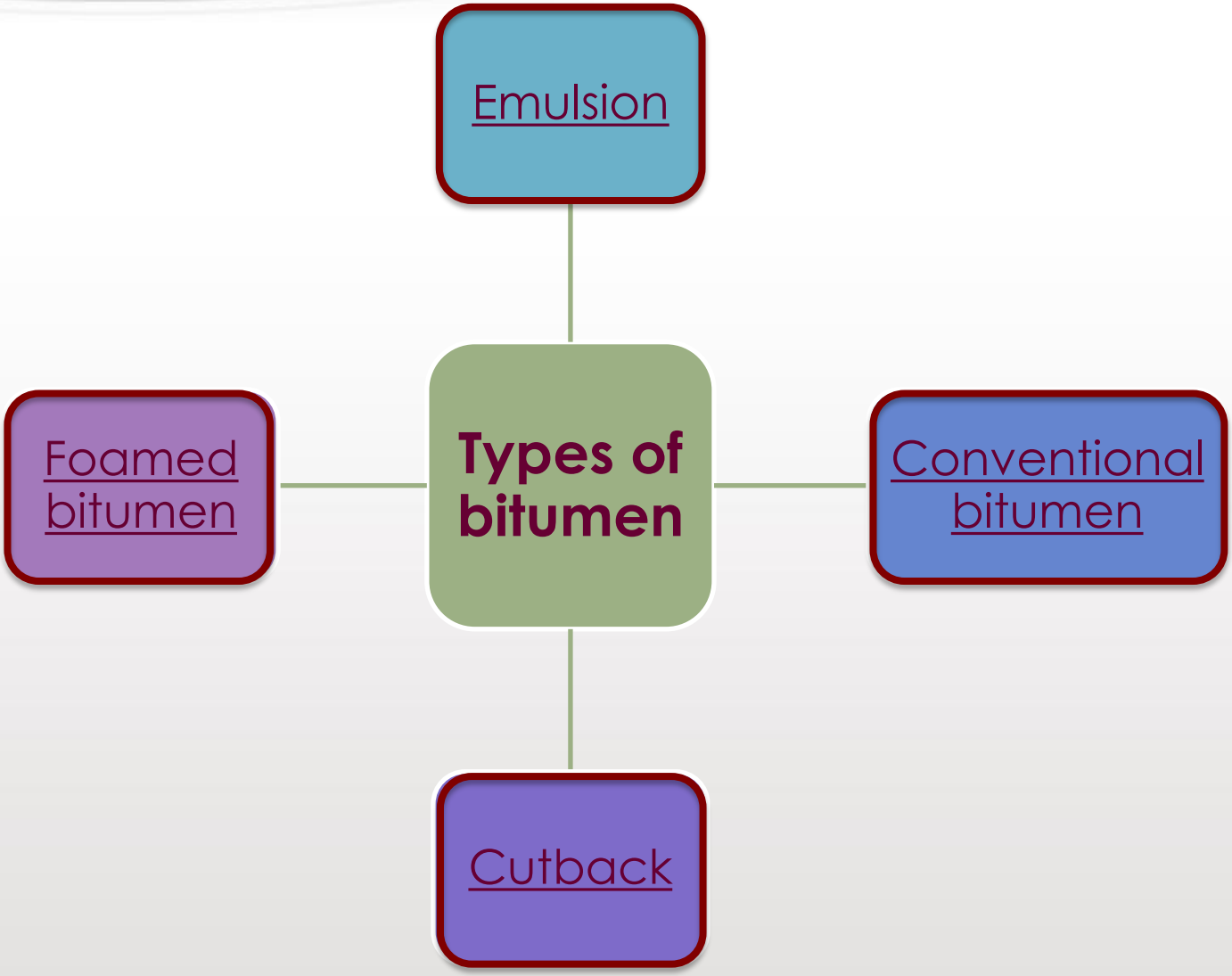

Bitumen Source
Natural
- in geological strata, (Trinidad lake and rock pores)
Petroleum
- by products of distillation of crude oil

Bitumen Composition



Bitumen Composition

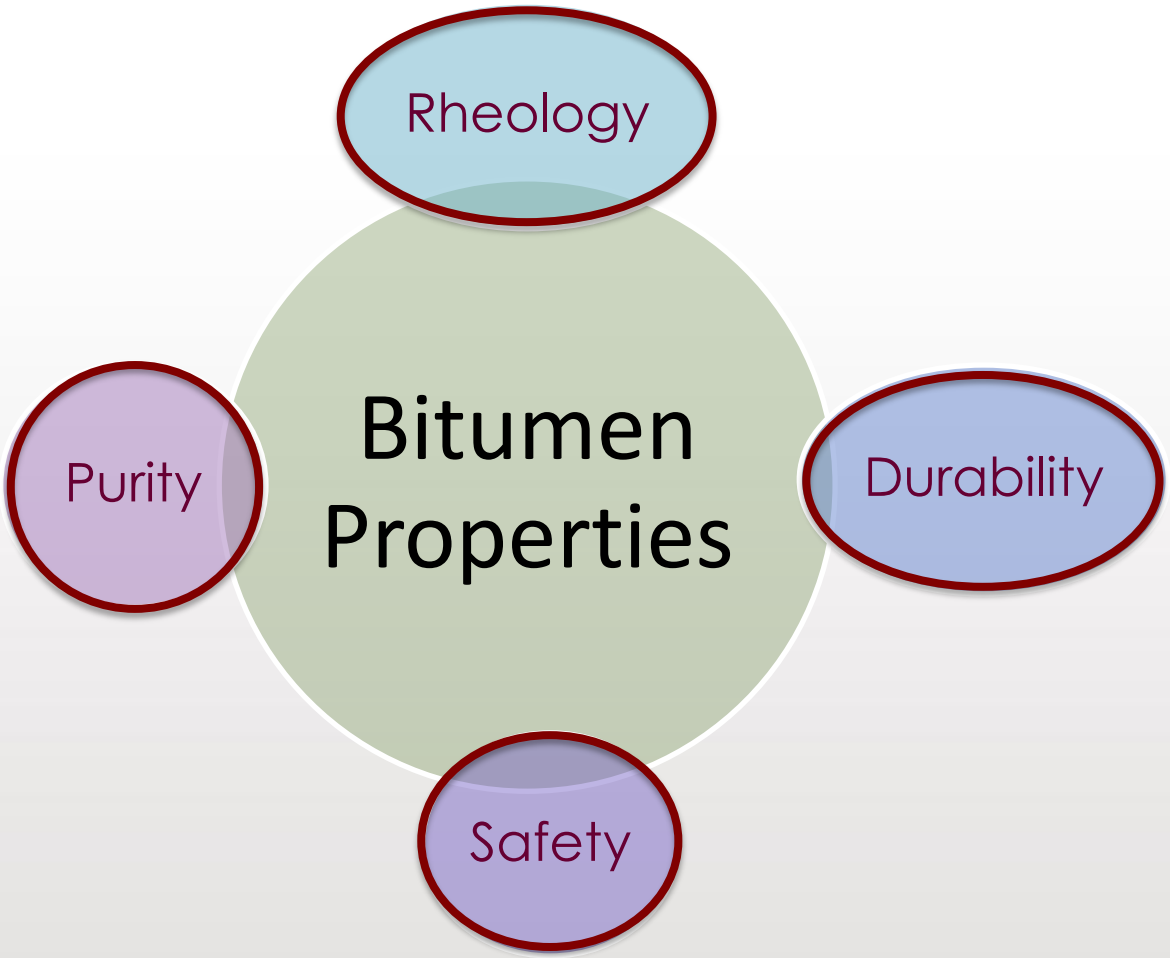



Emulsion
Foamed bitumen
Types of bitumen
Conventional bitumen
Cutback

Conventional bitumen

- ✓ Strong and durable
- ✓ Strong as paving material

- ✓ Black, sticky, semisolid and highly viscous
- ✓ Largest use in HMA


Rheology
Purity
Bitumen Properties
Durability
Safety

Grading System

- **Penetration Grade**: based on penetration test, (1PEN=0.1mm), high PEN (100-150) for cold climate, low PEN (30-40) for hot climate

- **Viscosity Grade**: based on viscosity test, unit in poises, Ex. AC-20, AR-4000

- **Performance Grade**: based on extreme hot and cold pavement temperature, ave. 7 days maximum & minimum temp. in ◦C, Ex. PG 64-16, rheological properties

Cutback Bitumen

- ✓ **Liquid bitumen = petroleum solvent + bitumen(50-80%)**
- ✓ **Low viscosity for lower application temperatures**
- ✓ **Three types:**

Rapid Curing – bitumen + gasoline (RC-70)

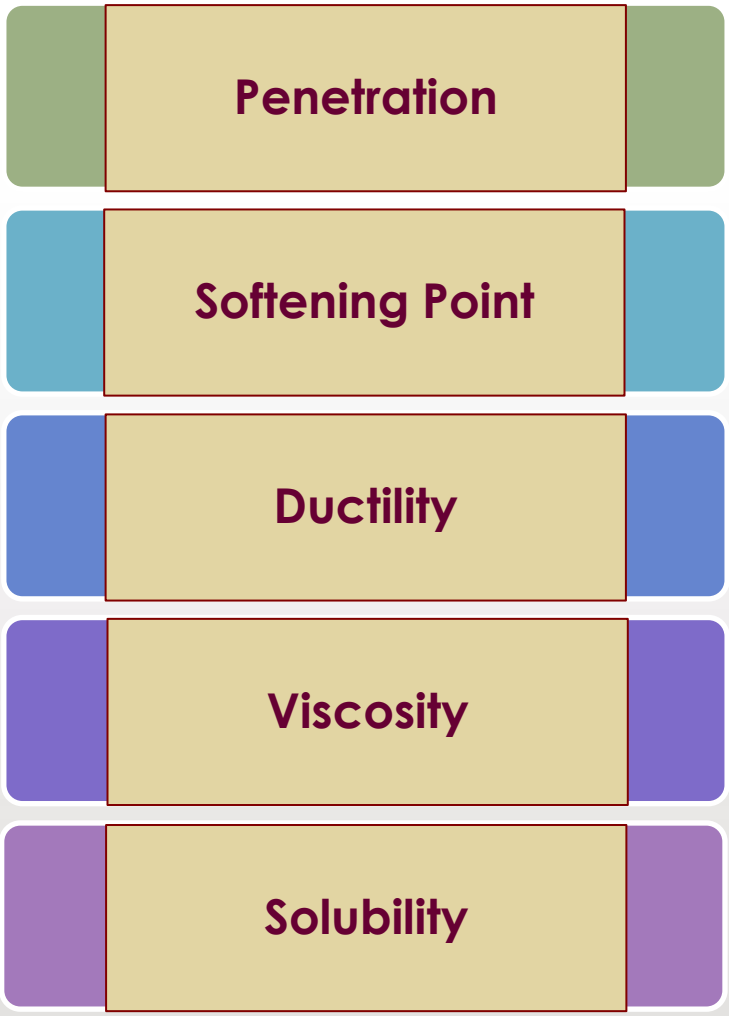
Medium Curing - bitumen + kerosene

Slow Curing – bitumen + diesel

Emulsified Bitumen

- ✓ Liquid bitumen = Bitumen (40-75%) + water (25-60%) + emulsifier (0.1-2.5%)
- ✓ Low viscosity for lower application temperatures
- ✓ Two most commonly used emulsions:
  - i. Anionic (-ve) – used with aggregate such as limestone
  - ii. Cationic (+ve) – used with aggregates such as sandstone
- ✓ Graded according to setting rate:
  - Rapid Set
  - Medium Set
  - Slow Set, SS1K

Bitumen Tests



Bitumen Tests

- Flash and Fire Point
- Loss on Heating
- Rolling Thin Film Oven test/Pressure Aging Vessel
- Dynamic Shear Rheometer

Thank You