



Standard Operating Procedure: SOP-BALL-27

FTIR of Bowling Ball Coverstock

<u>Rev</u>	<u>Date</u>	<u>Staff Member</u>	<u>Purpose</u>
Origination date: 03/21/2023		Originator: T. Frenzel	

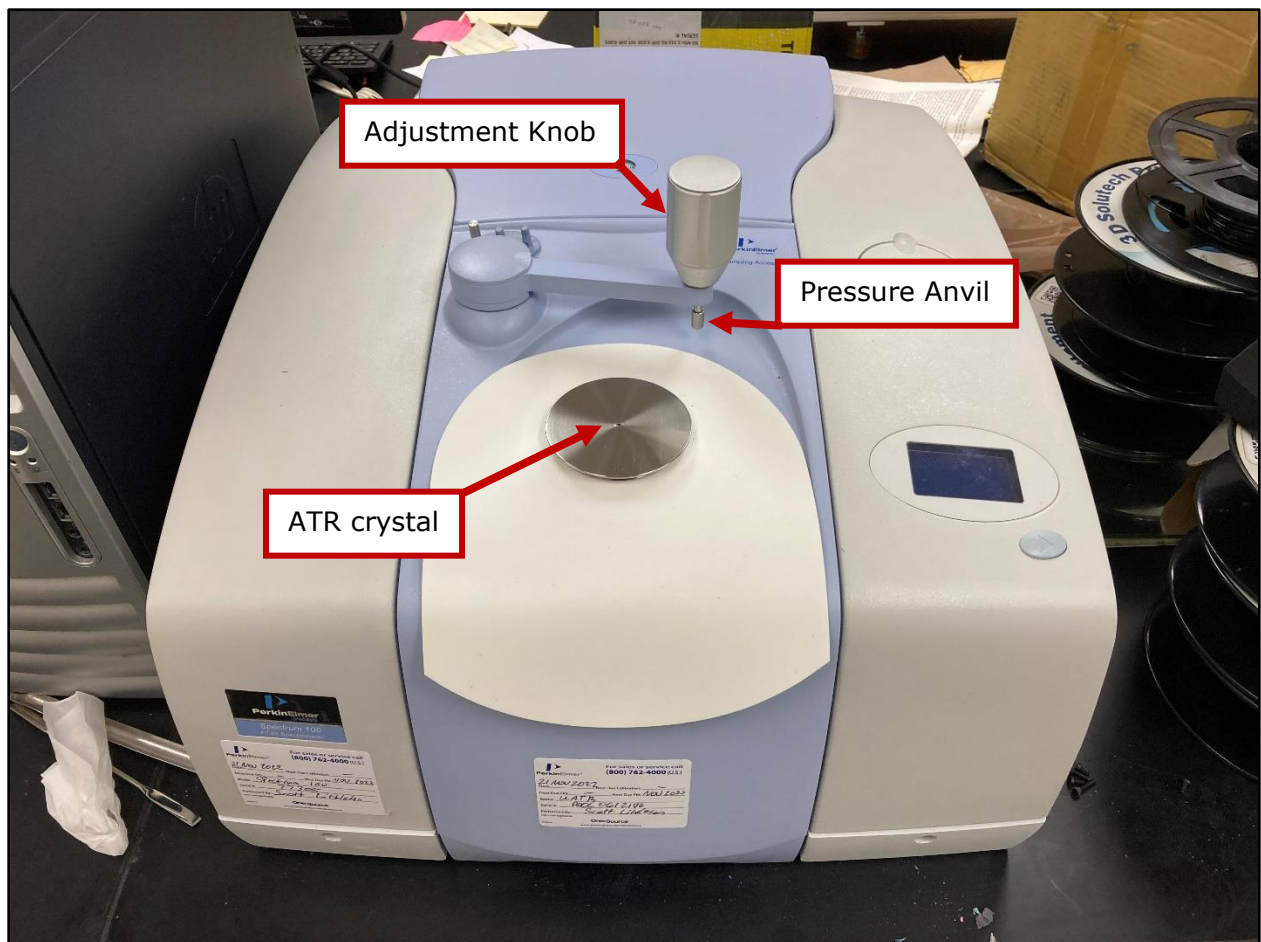
Purpose:

Measure FTIR spectrum of bowling ball samples to categorize the true coverstock type.

Materials:

- Bowling Ball
- Perkin Elmer Spectrum 100
- ATR measurement attachment, Crystal: Diamond/ZnSe
- Kim wipes
- Isopropyl Alcohol
- Bowling Ball drill press / drill bits
- Sample storage containers

Testing Apparatus:





Sample Preparation:

1. Label collection receptacle: ball brand, ball model, serial number, additional notes
2. Insert desired drill bit into chuck, 9/16" or larger produces adequate material.
3. Clean any residual shavings from previous samples if applicable.
4. Lock sample ball in press to drill desired location.
5. Rotate the handle to lower drill bit near ball surface
6. Rotate the selection knob to the forward position to power on drill press
7. Start pulling the handle to lower drill bit. When drill bit first makes contact with ball, power off drill press and continue to pull handle until bit stops.
8. Allow handle to return
9. Collect shavings with forceps, and place shavings in collection receptacle.
10. Label the receptacle with the following information: brand name, ball name, and serial number.
11. Repeat steps 4 through 8 to acquire more samples from the same location
12. If desired, a deeper hole can be drilled to obtain core samples. Make sure samples from the coverstock and core do not mix.
13. Once sample is collected, use vacuum to clean up any additional ball material.

Set-up:

1. Open the Perkin Elmer Spectrum software, and chose your user ID.
2. Clean ATR sample plate and crystal with isopropyl alcohol and a kim wipe.
3. Collect a background spectrum of the ATR crystal by selecting the background button in the upper right-hand side of the software.
4. Run the system ready checks to ensure the system is performing normally

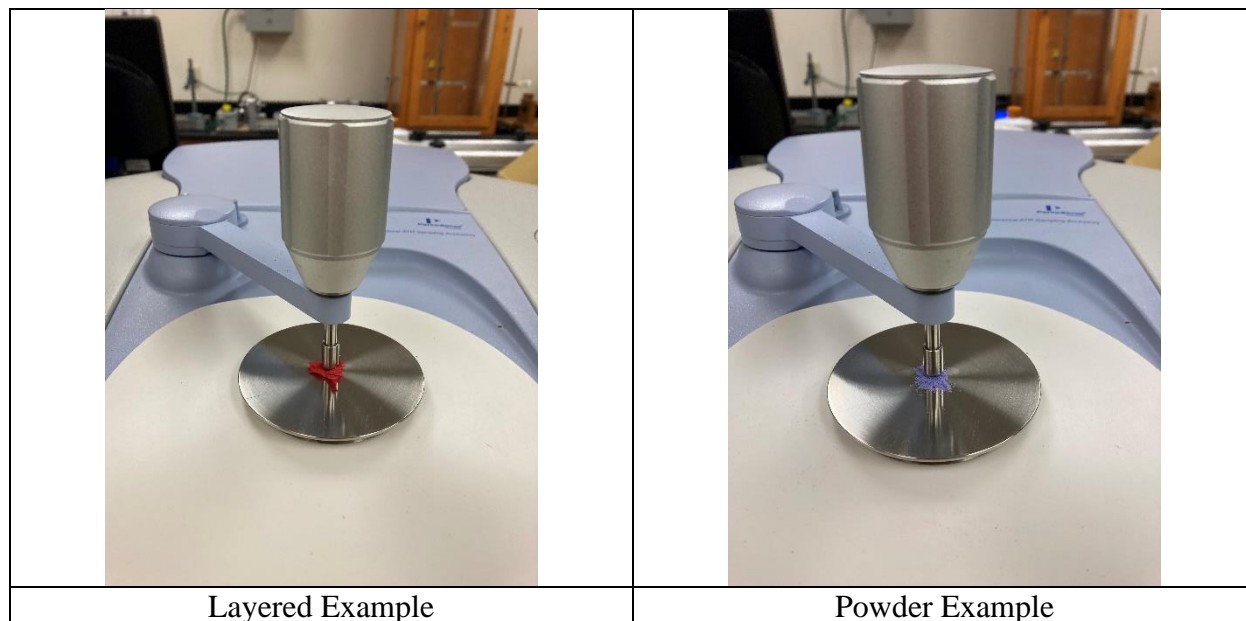
5. Apply the following instrument settings:

Abscissa (x-axis) units	Wavenumber
Ordinate (y-axis) units	%T
x-axis start (cm ⁻¹)	4000
x-axis end (cm ⁻¹)	650
Resolution (cm ⁻¹)	4
Scan Type	Sample
Accumulations	30 Seconds

6. The system is ready for data collection

Test Procedure:

1. Clean ATR sample plate and crystal with isopropyl alcohol and a kim wipe
2. Place three layers of coverstock sample over the crystal in the center of the ATR sample plate. Alternatively, if the coverstock sample breaks apart too easily to be layered, it can be ground into a powder and piled on top of the ATR crystal
3. Rotate the pressure anvil over the sample and tighten until the adjustment knob clicks.



4. In the sample ID field, name the file as follows: [Brand], [Ball Name], [Serial Number], [Test Number].



5. Select the scan button. This will start a spectrum preview and display the applied force between the pressure anvil and the sample.
6. Ensure that the knob is not tightened beyond a force of 150 pounds. If it is, reduce the pressure by slowly loosening the pressure anvil adjustment knob until the force is between 130~150 pounds.
7. Once the applied pressure is correct, select the scan button again to collect the data.
8. Once completed, the system will evaluate the quality of the spectra with a green, yellow, or red light.
9. Repeat steps 1 through 7 for a total of three tests on each ball sample that result in a green light spectra.
10. Scanned FTIR spectra will be compared back to known reactive, urethane, polyester, and epoxy ball spectra.
11. Material determination can be made by finding which material best matches the sample.
12. Samples matching no known materials to a similarity of 90% or more will be considered different materials.