

General Approach for Polymeric Casework

1 Introduction

Polymeric materials, such as adhesives and plastics, can be found in all types of materials including automotive parts, packaging, consumer products, and apparel.

Forensic polymer examinations involve either (1) characterizing a sample (e.g., determining whether a material is a polymer, its chemical composition, developing a probable source or end use) or (2) comparing two (or more) samples to determine if they can be differentiated.

2 Scope

This procedure describes general guidelines for Chemistry Unit caseworking personnel who analyze polymeric evidence submitted to the FBI Laboratory. Separate, detailed standard operating procedures exist that cover sample processing and acquisition of both physical and chemical compositional data on polymeric evidence.

3 Equipment/Materials/Reagents

Not applicable.

4 Standards and Controls

Not applicable.

5 Considerations for Other Forensic Examinations

Process clothing for trace evidence and/or polymeric transfer prior to any fabric impression or DNA examinations. Fragments or pieces of plastic should be processed for latent fingerprints or DNA prior to any polymeric examinations.

Regardless of which unit receives the items first, Paints and Polymers (P&P) personnel will visually and/or microscopically examine the items and any associated debris for polymeric evidence.

If latent fingerprint and/or toolmark examinations are requested on an item (e.g., a tool), the item should be examined for polymeric evidence first. The suspected polymeric material can be removed from the item with tweezers or a relatively soft, pliable material such as wood or

Teflon™. Metal probes and blades must not be used on the working end of a tool as they can alter the surface and interfere with subsequent toolmark examinations. Ensure appropriate laboratory precautions are observed when working with latent print evidence.

6 Procedure

Conduct a critical review of the contributor's request and the item(s) received. For a characterization request, first examine the material in question for manufacturer markings (e.g., part numbers, descriptors) that would provide useful information. If no such markings are found, analyze the material using some or all of the methods outlined in Figure 1. Based on the results of the analyses, determine whether the material is polymeric in nature, and if so, attempt to identify the polymer composition and/or end use(s). Use commercially available reference materials and instrumental reference libraries maintained in the FBI Laboratory to obtain compositional information.

In a comparison examination, establish if any differences are detected between two (or more) samples after subjecting them to the same rigorous analytical testing. Figure 2 shows a flowchart that outlines the scheme for a comparison examination of polymeric materials.

7 Sampling

Due to the wide variety of examination requests, numbers of samples submitted, and conditions of the samples submitted, P&P examiner discretion will determine the appropriate sample(s) to examine on a case-by-case basis. For indistinguishable samples, as determined by a discretionary number of analytical examinations, an option is to take an individual sample, assign a new item identifier (e.g., Item 1-1), specifically list the item in the item inventory, and discuss it independently in the *Laboratory Report*. Record the decision criteria used for determining the sample(s) selected in the case notes. If the complexity of the case warrants discussion of the sample(s) selection plan with another P&P examiner, also record this discussion in the case notes.

8 Calculations

Not applicable.

9 Measurement Uncertainty

Not applicable.

10 Limitations

- a. Sample size and condition can preclude conducting certain examinations.
- b. Sourcing capabilities of common synthetic polymeric materials is limited. This is directly related to the abundance of such materials in the marketplace and the number of end uses for many types of polymeric material.

11 Safety

Take standard precautions for the handling and disposal of chemicals and sharps. Use universal precautions when handling potentially biohazardous materials. Refer to the most current revision of the *FBI Laboratory Safety Manual* and appropriate Safety Data Sheet(s) for further details.

12 References

Alger, M.S.M. *Polymer Science Dictionary*. NY: Elsevier Science, 1989

FBI Laboratory Safety Manual

Seymour, R.B., Carraher, Jr., C.E. *Polymer Chemistry: An Introduction*, 2d ed. NY: Marcel Dekker, 1988.

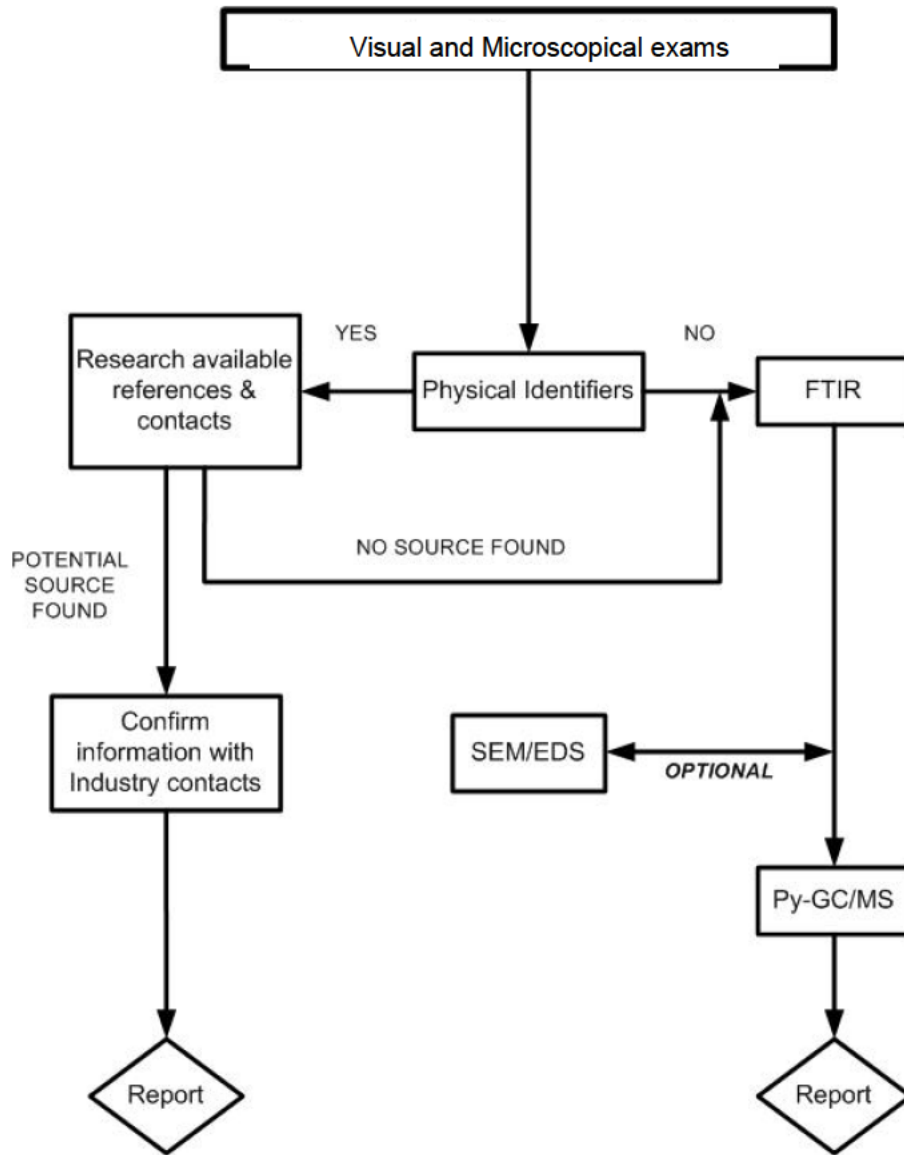


Figure 1: Analytical Scheme for Characterization of Polymeric Materials

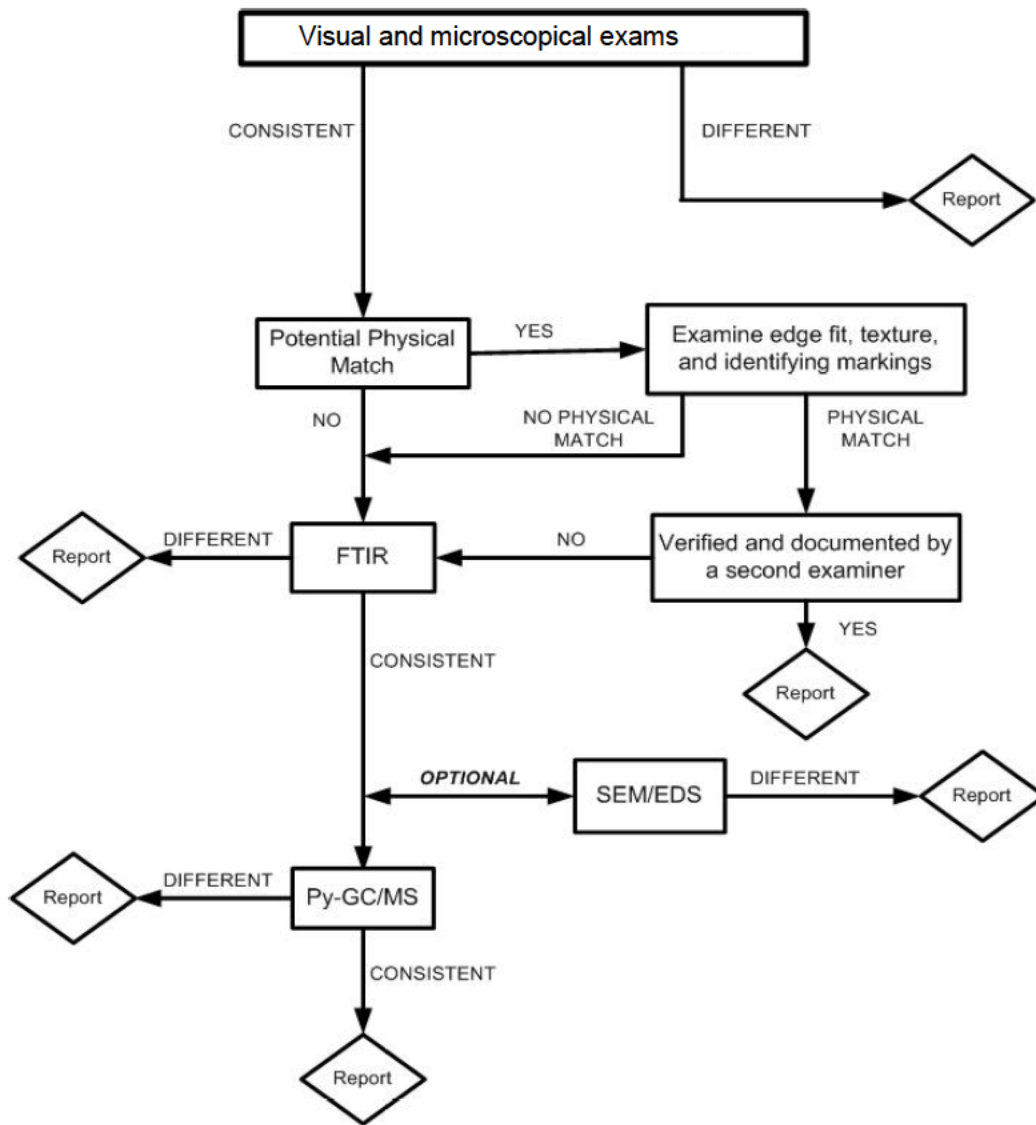


Figure 2: Analytical Scheme for Examination and Comparison of Polymeric Materials

Rev. #	Issue Date	History
0	06/21/06	New document that replaces previous document also titled <i>General Approach to Polymeric Casework</i> .
1	09/30/09	Added a section to describe the sampling plan. Revised Figure 1.
2	03/14/12	Clarified section 9 in regards to an identification request. Changed “sampling” to “sample selection” in section 10.
3	02/03/14	Updated item designator example in Section 10 to reflect new QA policies and made minor grammatical changes.
4	09/18/18	Updated Section 1, Introduction and revised scope to describe who document applies to; Removed Calibration and Types of Polymeric Evidence sections and renumbered. Updated Sections 5, 6, 7, 8 and 11 for clarity.
5	10/28/20	Minor edits of sections 1 and 6 and changing the word “identification” to “characterization” to align with other P&P SOPs. Reordered figures to align with Section 6; removed Section 5 as not relevant to the SOP scope; changed “Sample Selection” to “Sampling”; minor grammar edits throughout.

Approval

Redacted - Signatures on File

Paints and Polymers
Technical Leader:

Date: 10/27/2020

Chemistry Unit Chief:

Date: 10/27/2020