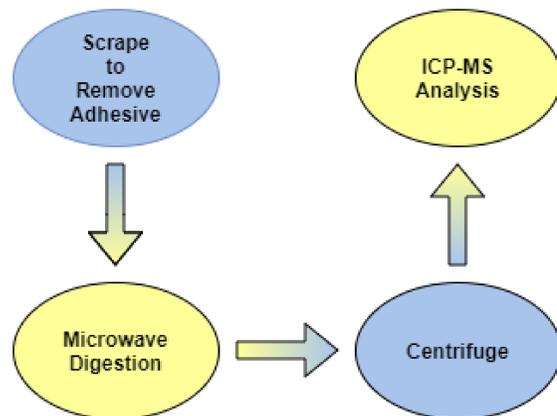


Introduction

- Duct tape is commonly found at crime scenes
- Current analysis is not always effective
- Tape has 3 parts, backing, scrim, and adhesive¹
- ICP-MS allows for trace metal analysis of materials
- The objective of this research was to use ICP-MS to analyze the trace metals in duct tape adhesive and determine if there was a difference between the adhesives of different brands.

Methods



- Adhesive soaked in methanol to easier remove
- Centrifuged due to white particles. Titanium Dioxide?
- Any concentrations that were below detectable limits were represented as a value equal to 1/2 of the detection limit
- An ANOVA test was used to determine if the values for each brand were statistically different from the other brands.

Results

- Many of the elements in duct tape adhesive were determined to be statistically different within the three brands examined
- Duck brand duct tape was problematic, with many of the concentrations of the elements being below the detection limit.
- While most of the element concentrations were statistically different, there needs to be more research to determine whether this method is successful

Table 1: ANOVA test results with the null hypothesis being that the concentrations of trace elements in various brands of duct tape adhesive in the same throughout the brand.

Element	Null Hypothesis	P Value
Be	Reject	<0.001
Na	Reject	0.013
Mg	Reject	0.015
Al	Reject	<0.001
K	Cannot Reject	0.056
Ca	Reject	0.015
V	Reject	0.001
Cr	Reject	0.006
Mn	Reject	0.021
Fe	Reject	0.003
Co	Cannot Reject	0.074
Ni	Reject	<0.001
Cu	Reject	<0.001
Zn	Reject	0.031
As	Cannot Reject	0.081
Se	Cannot Reject	0.467
Mo	Reject	0.015
Ag	Cannot Reject	0.465
Cd	Reject	0.019
Ba	Cannot Reject	0.327
Hg	Cannot Reject	0.464
Tl	Cannot Reject	0.159
Pb	Reject	0.001
Th	Reject	0.007
U	Cannot Reject	0.074

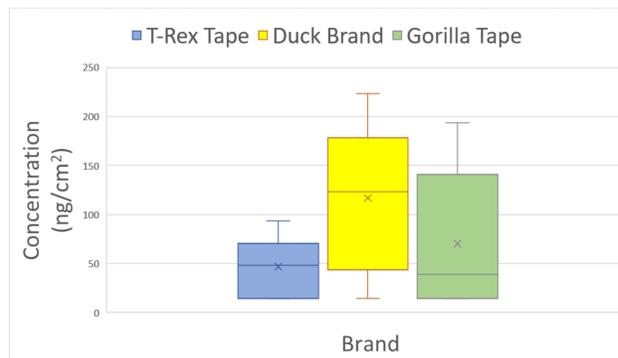


Figure 1: Variance in brands of duct tape for element Sodium

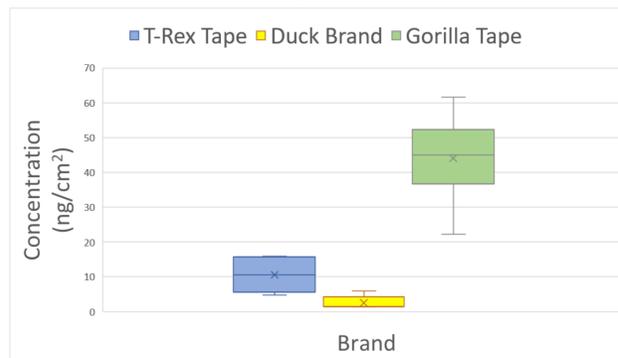


Figure 2: Variance in brands of duct tape for element Manganese

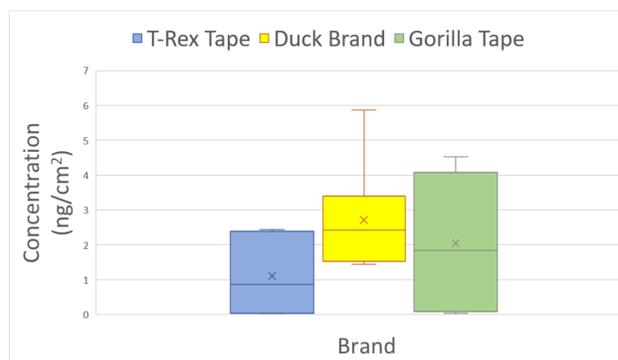


Figure 3: Variance in brands of duct tape for element Cobalt



Discussion

- The adhesive of duct tape could be analyzed via ICP-MS to match trace elements to brand of tape
- More research must be done, but this analysis shows that most of the concentrations of elements in duct tape adhesive are significantly different from the concentrations in another brand of duct tape.
- A better method needs to be developed for the removal of adhesive. A better solvent could be suitable.

Conclusion

- Only 3 brands were analyzed in this research. More brands and trials need to be analyzed to determine that this technique is acceptable.
- ICP-MS may be better used in combination with FT-IR than XRF
 - XRF doesn't excite lower mass elements very well (Be, Li, etc.)

References

1. United States Patents. Patent number 5,162,150. Duct Tape. 1992.
2. Dobney, A. M.; Wiarda, W.; de Joode, P.; van der Peijl G. J. Q. 2001. *Netherlands Forensic Institute*. 276-287