

Application Note AN-RS-033

Raman and SERS identification of YABA, a popular street drug

Two chemical analyses from one tablet

Yaba, which means «crazy medicine» in Thai, is a small, colorful tablet containing a potent mixture of caffeine and methamphetamine. It is produced in Southeast Asia, where it is a popular drug of abuse and is actively targeted by police squads. Two strong and highly addictive stimulants make up Yaba: caffeine, which comprises up to 60% of each tablet, and methamphetamine at approximately 20%. Identification of two active ingredients in different proportions in a tablet, complicated by excipients and colored coatings, could be an analytical nightmare.

With handheld Raman, bulk material identification is achieved in seconds onsite with simple point-and-shoot analysis. SERS (surface-enhanced Raman spectroscopy) analysis is used to detect the minor component in mixtures without interference from fillers, dyes, and coatings. **MIRA DS is uniquely capable of both analyses—** Raman testing positively identifies caffeine in Yaba, while methamphetamine can be detected with SERS sampling. This application describes quick, dual analysis of Yaba tablets with MIRA DS.

INTRODUCTION

Handheld Raman is the perfect tool for instant, onsite analysis of street drugs. MIRA DS can easily penetrate the colored coating of tablets to analyze the interior. Raman systems will effectively identify the dominant component(s) in a mixture. With ID Kit and the SERS Attachment for MIRA DS, minor or trace components of a mixture can be revealed.

SAMPLING WITH RAMAN

For Raman analysis of Yaba, the tablet was sampled directly by laying it on a horizontal surface, positioning the Right Angle attachment over it, and collecting data. Smart Acquire on MIRA DS simplifies material identification: arm the laser, press acquire, and the system automatically determines optimal acquisition parameters for best quality spectra. Then, the instrument processes the data, performs library searches, and publishes a result with associated color-coded warnings—all in less than a minute. The initial test of Yaba with Raman yielded a positive identification of caffeine, with a high Hit Quality Index (HQI) = 0.81, meaning that sample and library spectra were well correlated (Figure 1).



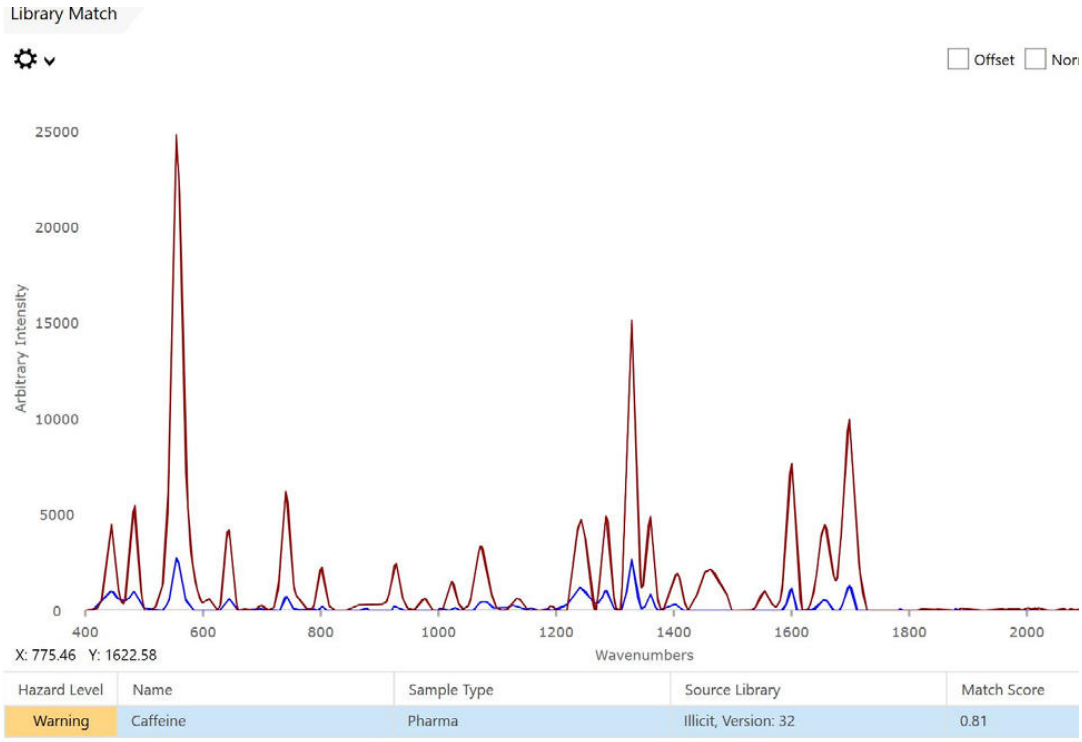


Figure 1. Yaba sample (blue) matched to caffeine (red) in the Illicit Library in Mira Cal DS.

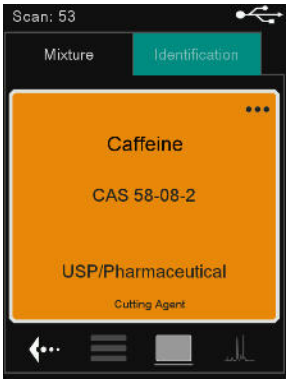


Figure 2. Actual screenshot of identification of caffeine in Yaba with MIRA DS. Caffeine is a chemical commonly associated with illicit drugs. The yellow warning background provides immediate, actionable information about the nature of the sample.

SAMPLING WITH SERS

SERS typically requires that materials be solvated for adsorption to SERS substrates, therefore all materials necessary for this application are included in ID Kit for MIRA DS. ID Kit is used with the SERS Attachment, which automatically activates the SERS Operating Procedure when connected to MIRA DS.

Sampling was straightforward: part of a Yaba tablet was crushed and dissolved in ethyl acetate, then this solution was applied to a silver P-SERS strip. The P-SERS strip was inserted into the SERS attachment on MIRA DS for data collection. With SERS analysis, it was possible to obtain a positive identification of methamphetamine, the minor active component in the Yaba tablet.



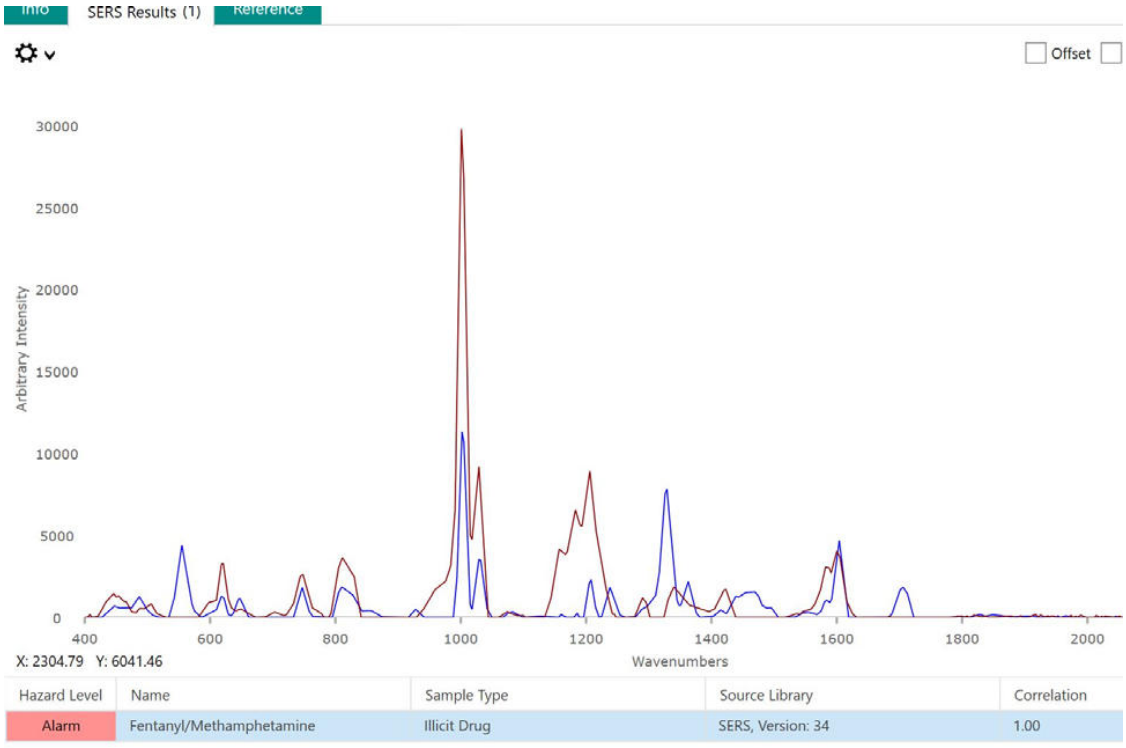


Figure 3. Identification of methamphetamine (sample in blue, library spectrum in red) in Yaba with SERS.

CONCLUSION

Handheld Raman can play an important role in field testing for addictive and potentially dangerous street drugs. MIRA DS helps to establish presumptive evidence of narcotics, which is then established through further testing.

Not only can MIRA DS quickly and accurately identify components in a suspicious tablet, it can be used for through-container testing. This helps to protect defense and security professionals from unknown illicit or otherwise dangerous substances in the field.

MIRA DS also excels at white powder analysis. Fentanyl is cut with heroin, which is then cut with baking soda (sodium bicarbonate), sugar, caffeine, and starches. When a well-known cutting agent is detected during white powder analysis with handheld Raman, SERS can subsequently identify the active opioid(s). This is an excellent illustration of two important functions of the MIRA DS handheld Raman system. One compact instrument can be used—even by non-technicians in the field—to quickly and easily perform both bulk Raman identification and SERS trace analysis with great accuracy.



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CONFIGURATION



MIRA DS Advanced

Metrohm Instant Raman Analyzer (MIRA) DS は、薬物、爆発物 出発物質、有害物質などの違法物質の迅速な非破壊測定に使用される、頑丈かつ高性能なハンドヘルドラマンスペクトロメーターです。MIRA DS は、小型な装置ながら極めて堅牢で、弊社独自の軌道走査スキャン (ORS) 技術を搭載した高効率分光器を特長としています。

Advanced package には、校正標準、ボトルまたはバッグにおける分析または直接分析のためのユニバーサルアタッチメント、直角アタッチメントが含まれ、表面および(または)バッグ内でのサンプルの処理に最適です。クラス 3B 操作。MIRA DS は、Metrohm のハンドヘルドラマンライブラリに対応しています。



ID - P-SERS (Ag P-SERS)

IDキット - Ag P-SERS には、Mira/Misaユーザーが P-SERS銀基板でSERS分析を行うのに必要なコンポーネントが含まれています。このキットには、使い捨てのへら、滴下ピペット、サンプルボトル、およびP-SERS 銀ストリップが2個含まれています。