Portable Raman Spectroscopy for Water Quality Monitoring in Remote Indigenous Communities

The Solution

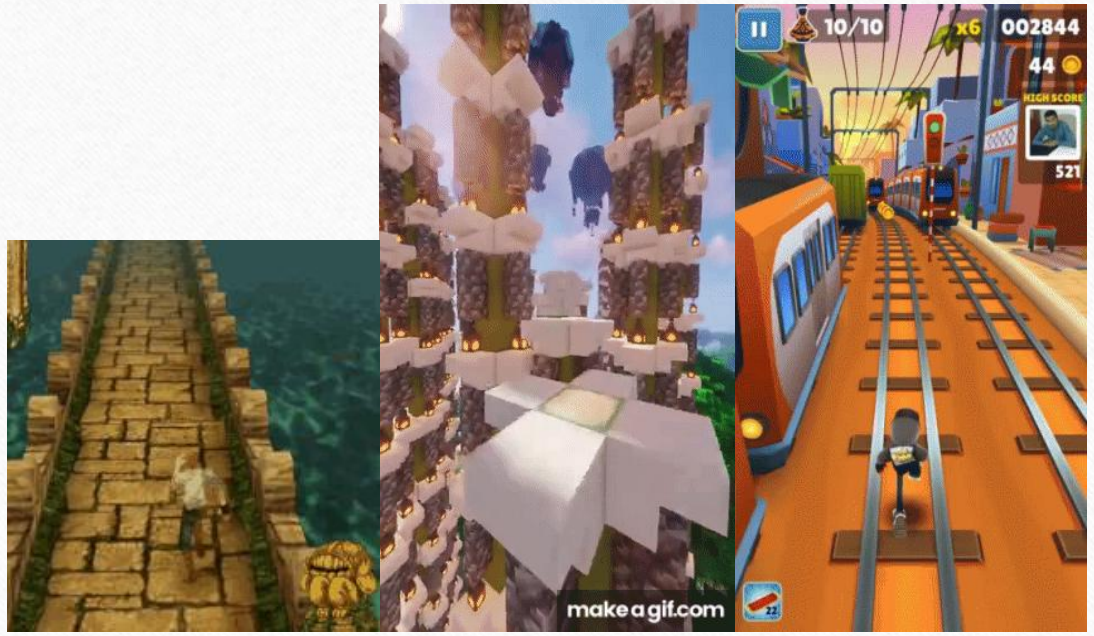
- Unique molecular fingerprints for each contaminant
- Portable, handheld system
- No lab needed: results in minutes
- Works ideally with water samples
- Detects at parts-per-billion levels

The Problem

- 19 communities (WA): Nitrate >50 ppm
- NT: Uranium 57 μg/L (3× limit)
- SA: Hardness, fluoride, turbidity
- >500 communities lack consistent testing

The Approach

- Data Sovereignty: Communities own their data
- Build Competency, not Dependency: Train Indigenous rangers
- Genuine Benefit: Fix problems, don't just document



References:

[1] R. Fielden, "Real-time water quality monitoring for Homeland communities," Australian Water Association, 2024.

[2] Z. Li, M. J. Deen, S. Kumar and P. R. Selvaganapathy, "Raman Spectroscopy for In-Line Water Quality Monitoring Instrumentation and Potential," Sensors, vol. 14, no. 9, pp. 17275-17303, 2014.

[3] B. K. Balasooriya, J. Rajapakse and C. Gallage, "A review of drinking water quality issues in remote and indigenous communities in rich nations with special emphasis on Australia," Science of the Total Environment, vol. 903, 2023.

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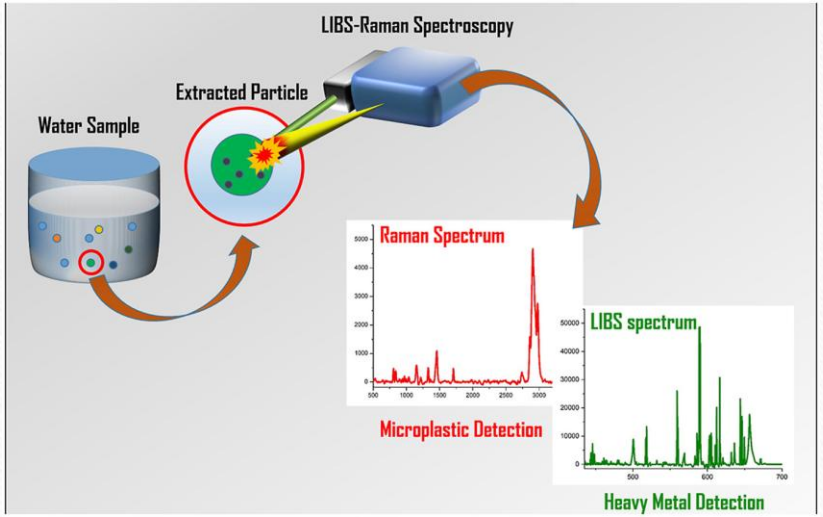

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Category	Contaminant	MCL	Potential Health Effect for Long Term Exposure	Vibrational Spectroscopy Application
Microorganisms	Cryptosporidium	Zero	Gastrointestinal illness	Raman, FTIR
	Giardia lamblia	Zero	Gastrointestinal illness	Raman
Disinfection by-products	Chlorite	800 ppb	Anemia, nervous system effects	Raman, NIR
	Total Trihalomethanes	80 ppb	Liver, kidney or central nervous system problems, risk of cancer	Raman, MIR,
Disinfectants	Chlorine	4 ppm	Eye/nose irritation; stomach discomfort	FTIR, NIR,
	Chlorine dioxide	800 ppb	Anemia, nervous system effects	Raman, MIR
Inorganic chemicals	Cyanide	200 ppb	Nerve damage or thyroid problems	Raman
	Copper	1.3 ppm	Liver or kidney damage	NIR
	Arsenic	10 ppb	Skin damage or problems with circulatory systems	Raman, MIR, NIR
Organic chemicals	Benzene	5 ppb	Anemia; decrease in blood platelets; increased risk of cancer	Raman, MIR, NIR
	Toluene	1 ppm	Nervous system, kidney, or liver problems	Raman, MIR, NIR
	Chlorobenzene	100 ppb	Liver or kidney problems	MIR
Radionuclides	Uranium	30 µg/L	Increased risk of cancer, kidney toxicity	Raman

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