SANITATION DISTRICTS OF LOS ANGELES COUNTY

Sampling, Extraction and Analysis of Microplastics

Challenges for Wastewater Treatment Plants

Steve A. Carr

Jin Liu

Arnold Tesoro

Microplastics Methods Standardization Workshop

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TYPES OF PLASTICS

Most popular / commonly used plastics

- Polyethylene (PE)
- Acrylic Polymethyl methacrylate (PMMA nylon)
- Polyethylene Terephthalate ($PET_{polyester}$)
- Polyvinyl Chloride (PVC)
- Polycarbonate (PC)
- Polypropylene (PP)
- Acrylonitrile-Butadiene-Styrene (ABS)

PLASTICS CAN BE SEPARATED INTO TWO BROAD GROUPS

THERMOPLASTICS

- Can be re-melted
- Recycled into new products
- Examples - polyvinyl chloride, polyethylene, polypropylene, nylon polystyrene, poly-carbonate etc.

THERMOSETS

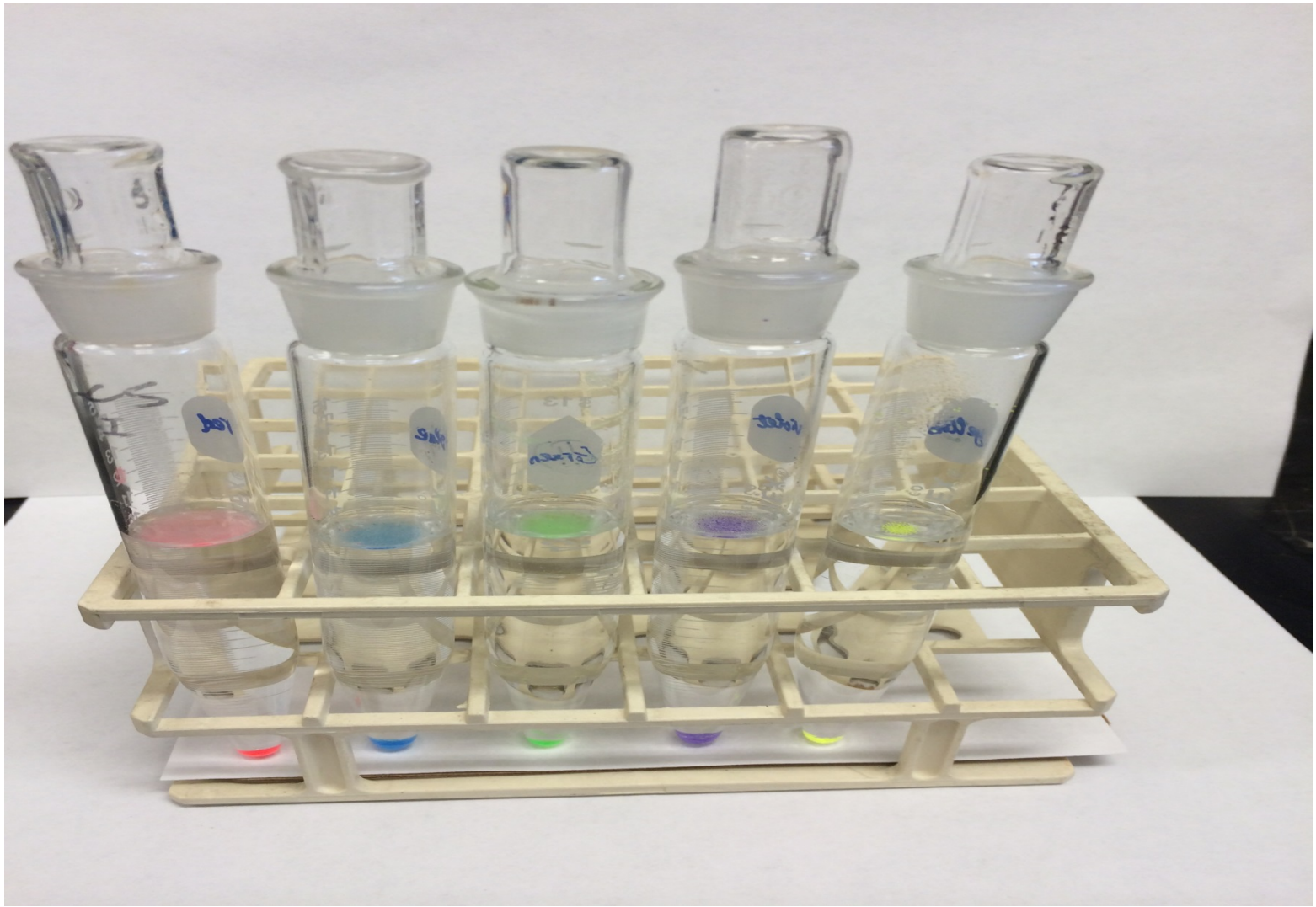
- Are usually formed and cured as a final product in a single step
- Cannot be re-melted or returned to their pre-synthetic state.
- Examples - vulcanized rubber, acrylics, melamines, polyurethanes, epoxies, silicone etc.

Identification of Microplastics

- Visual sorting (microscope, magnifying glass etc.)
- Tactile probing using micro-spatulas
- Morphology (spheres, geometric features)
- Physical / chemical properties (density, deformity)
- Acidic Digestion / Enzyme digestion, and Oxidative cleanups
- FT-IR / Raman / GC-MS / Pyrolysis / NMR

Cospheric Microspheres

Microsphere Distribution in H_2O

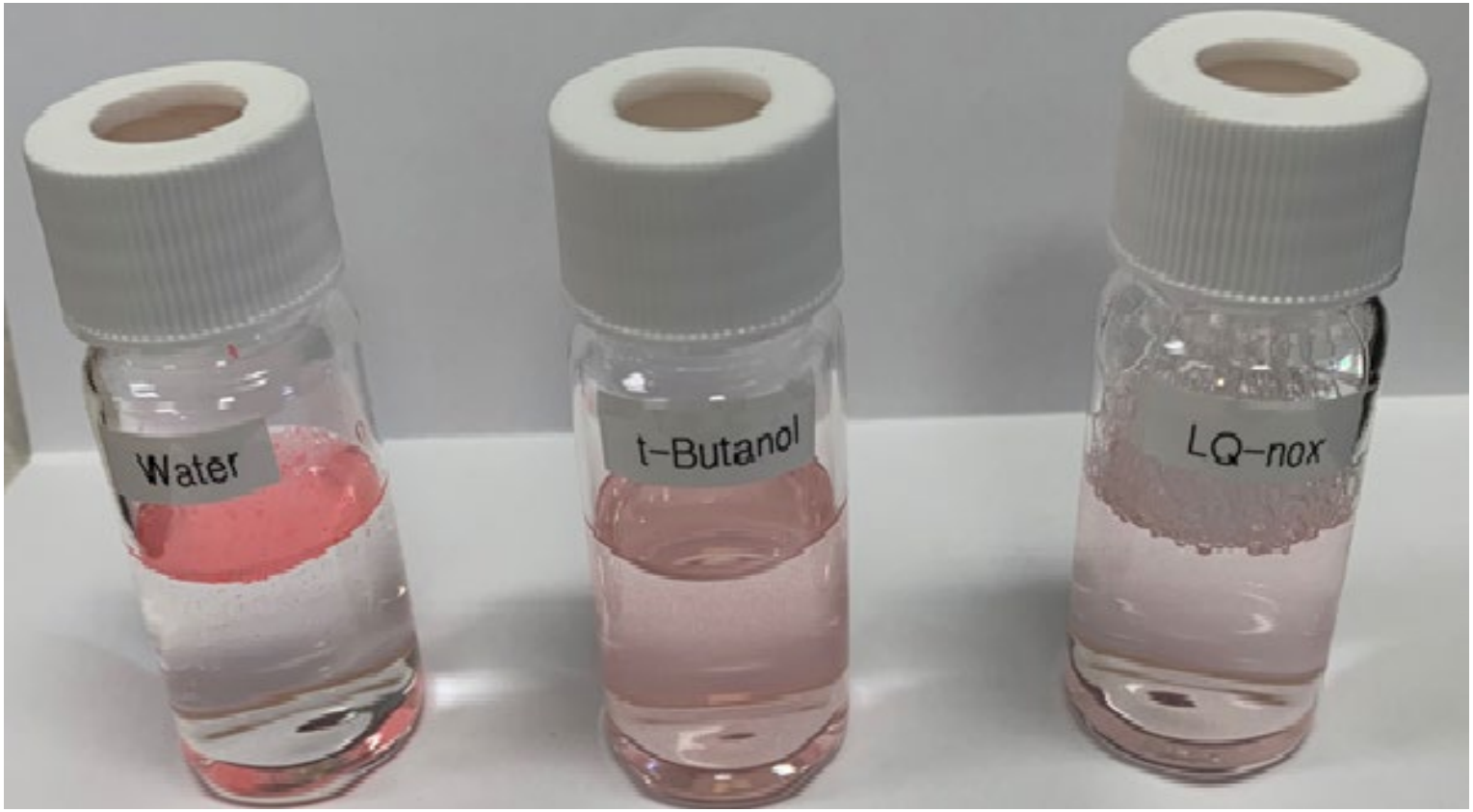


Mixed Liquor Imhoff

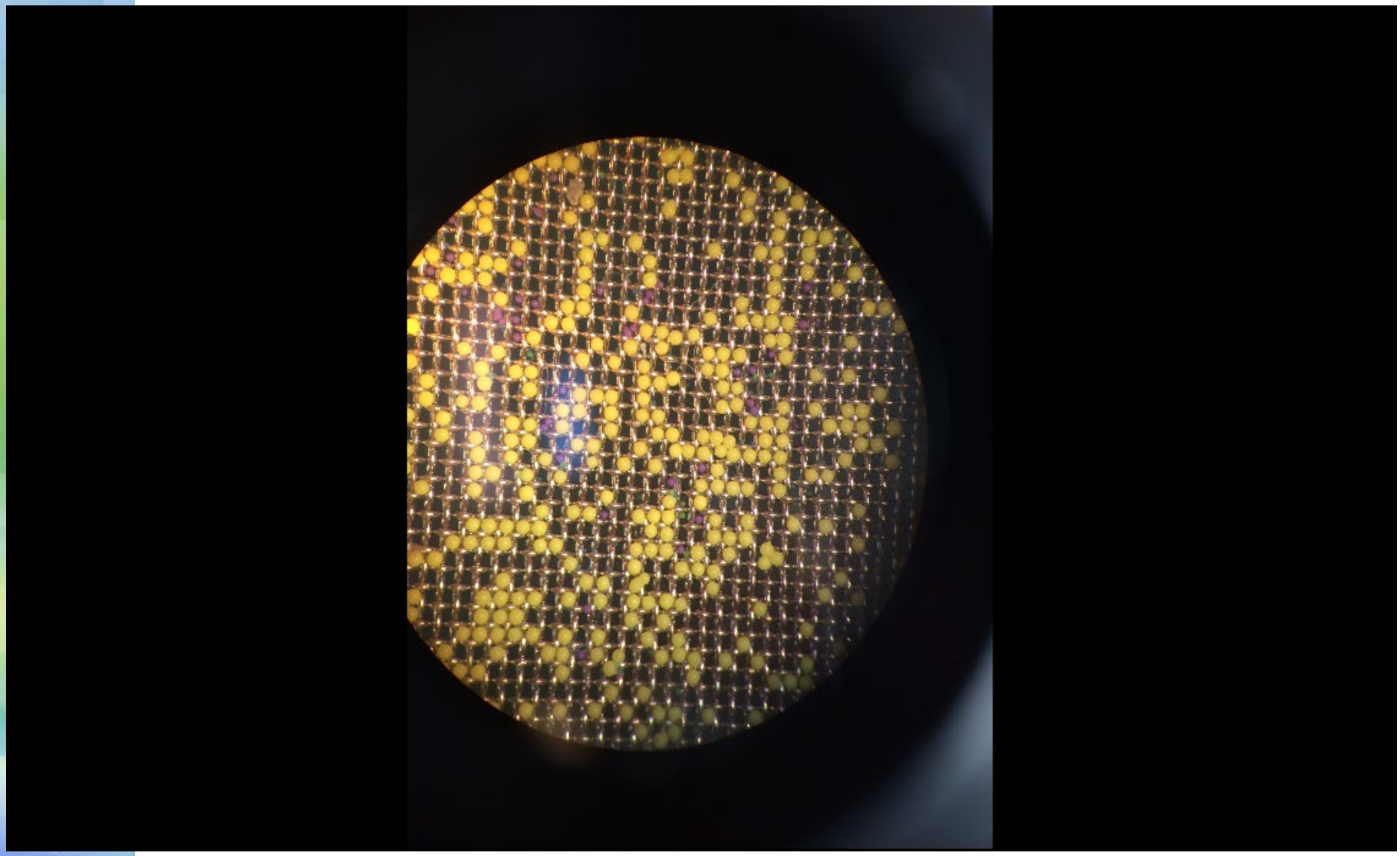
Imhoff ML Settling Test (10 min)

Imhoff Settling (1 hour)

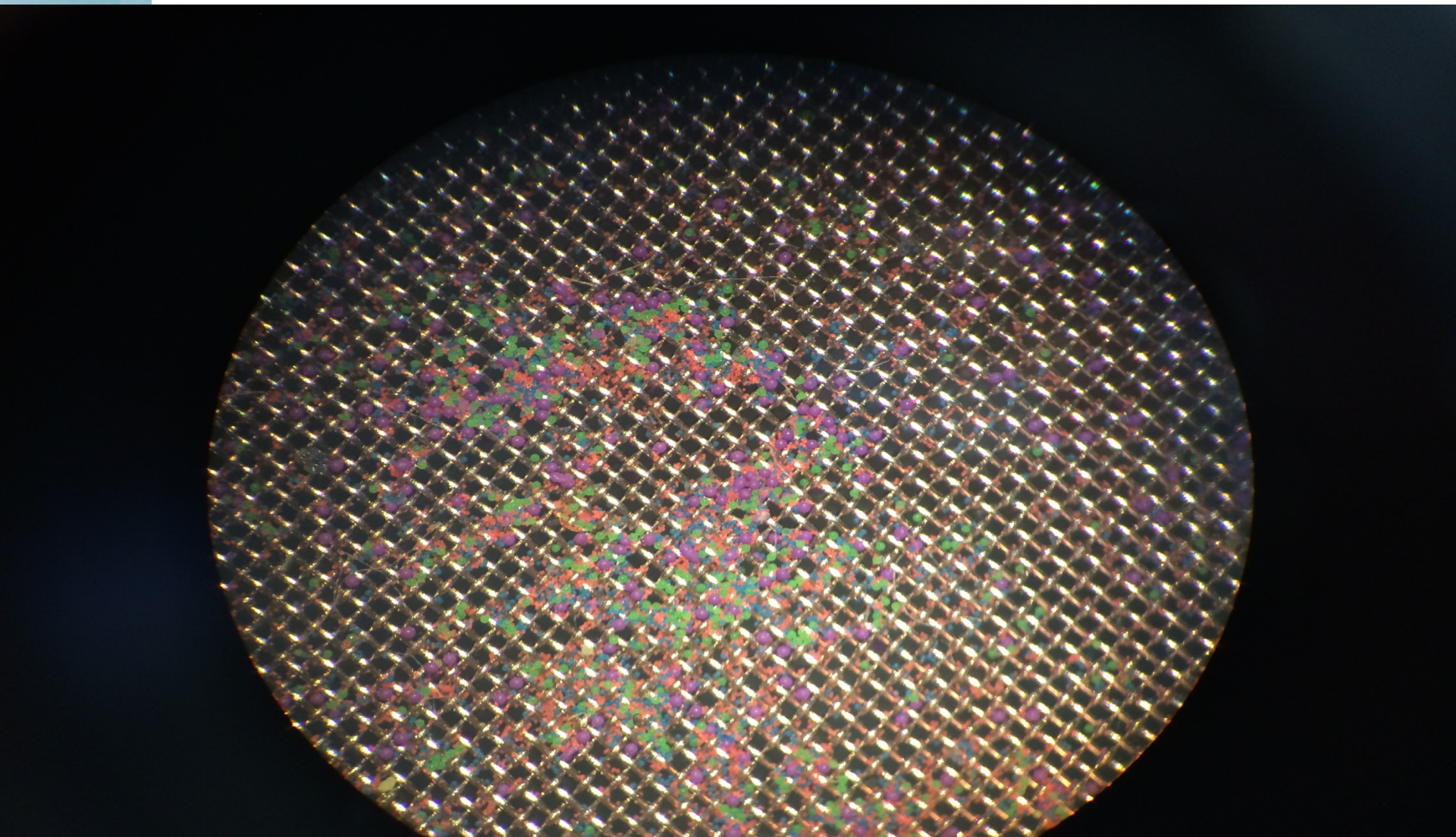
Microplastic Dispersion



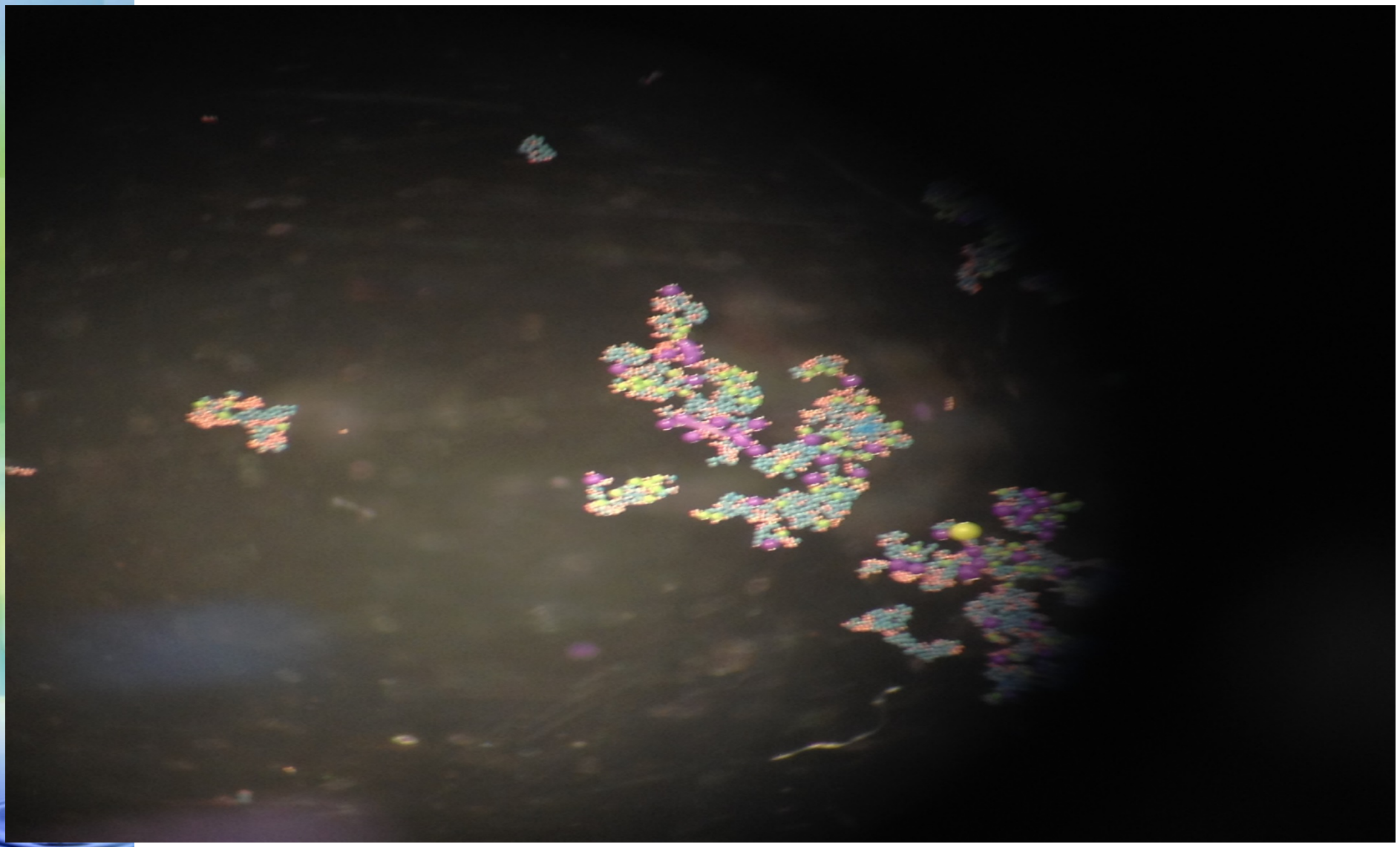
Microspheres 300 µm on 246 µm mesh



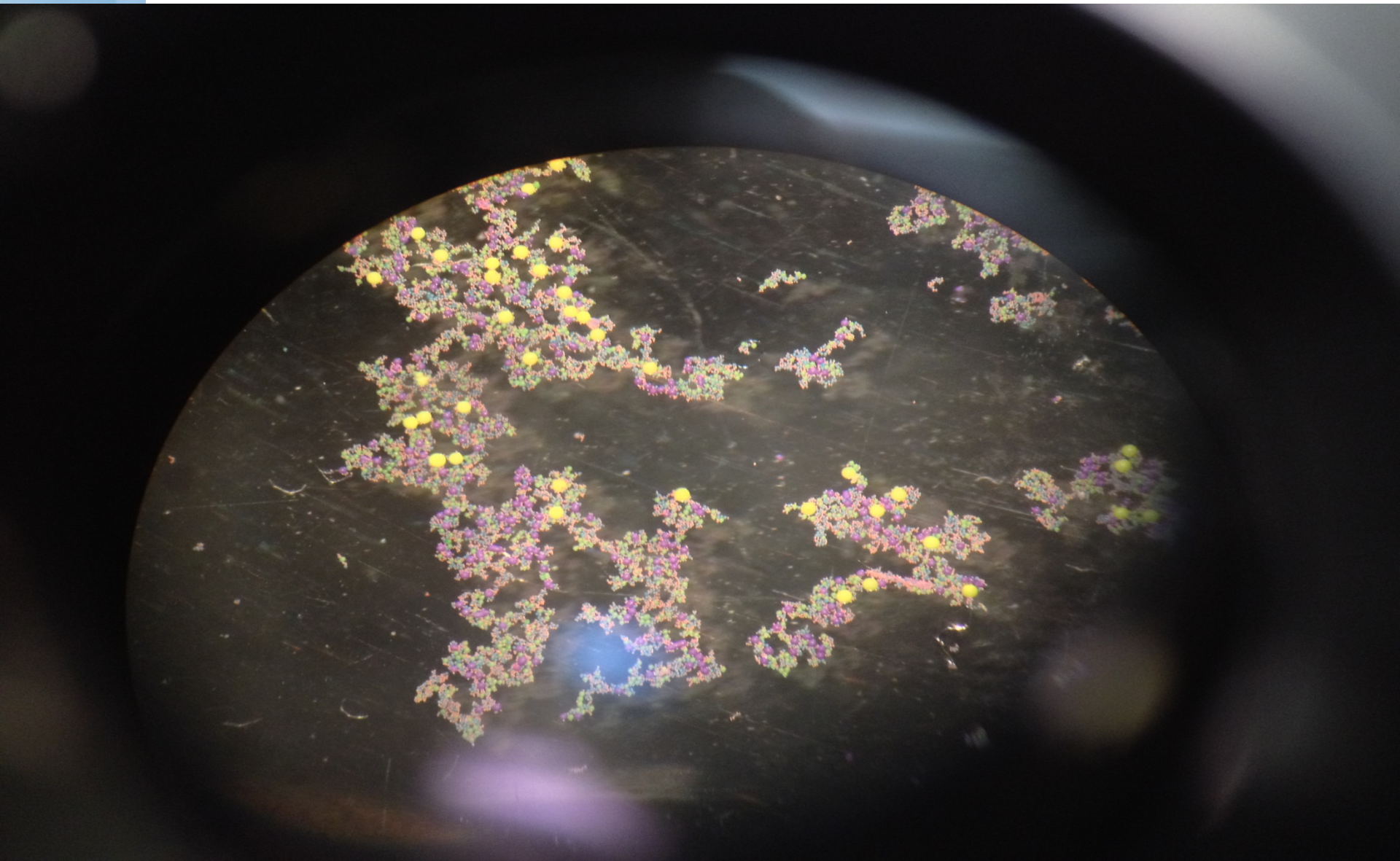
Microspheres (45, 63, 106, 150) µm on 246 µm Mesh



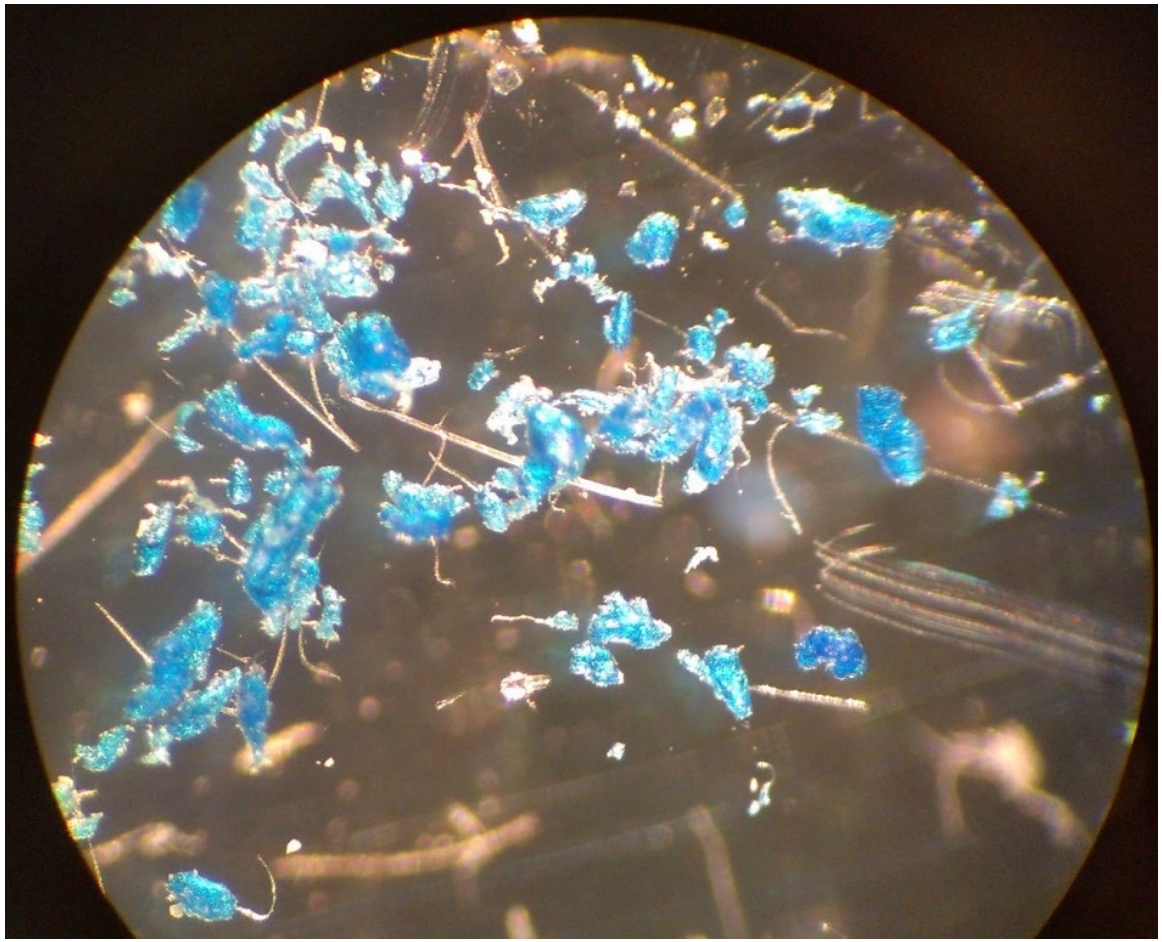
Microplastic Spheres in H_2O



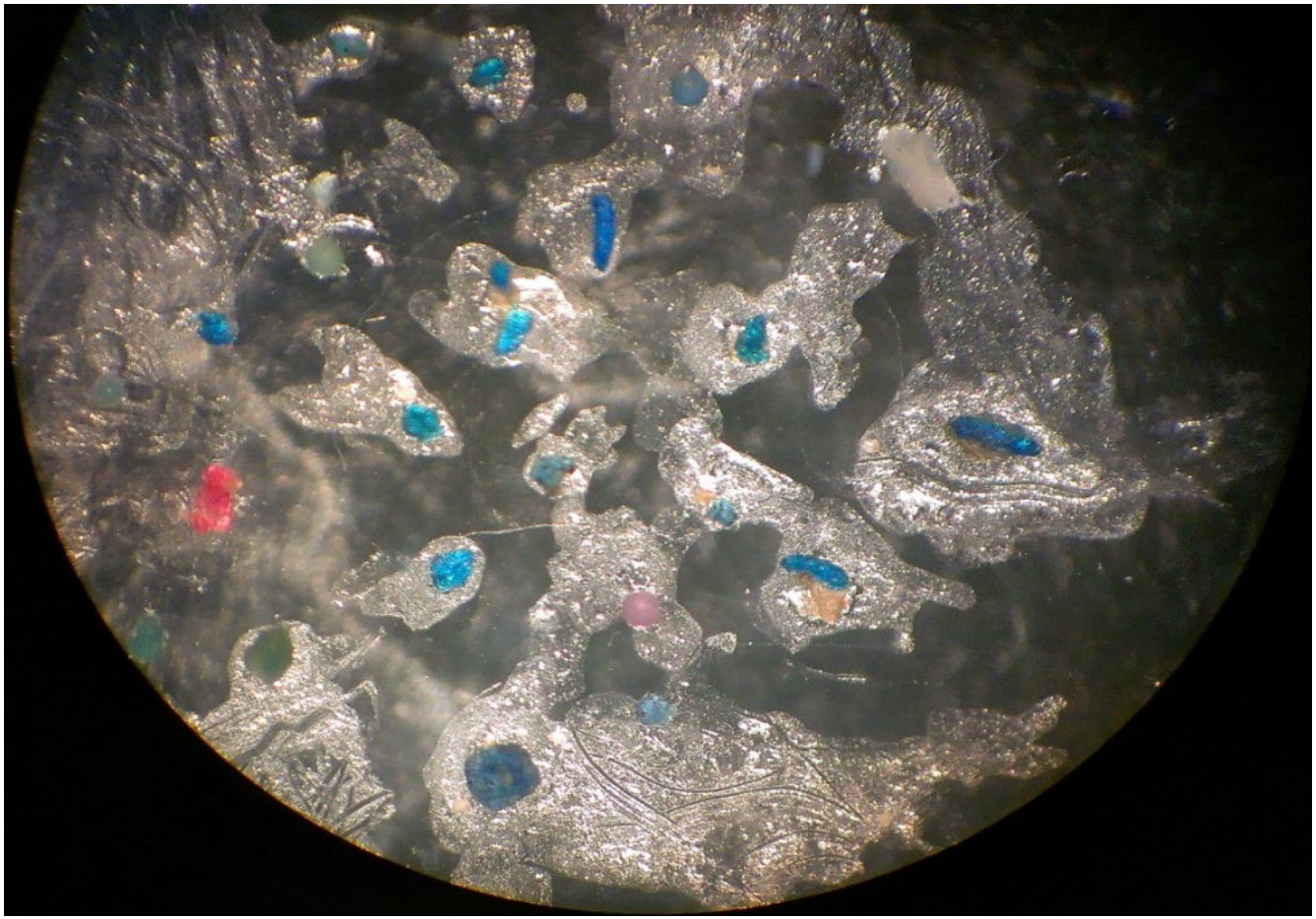
Microplastic Spheres in H_2O



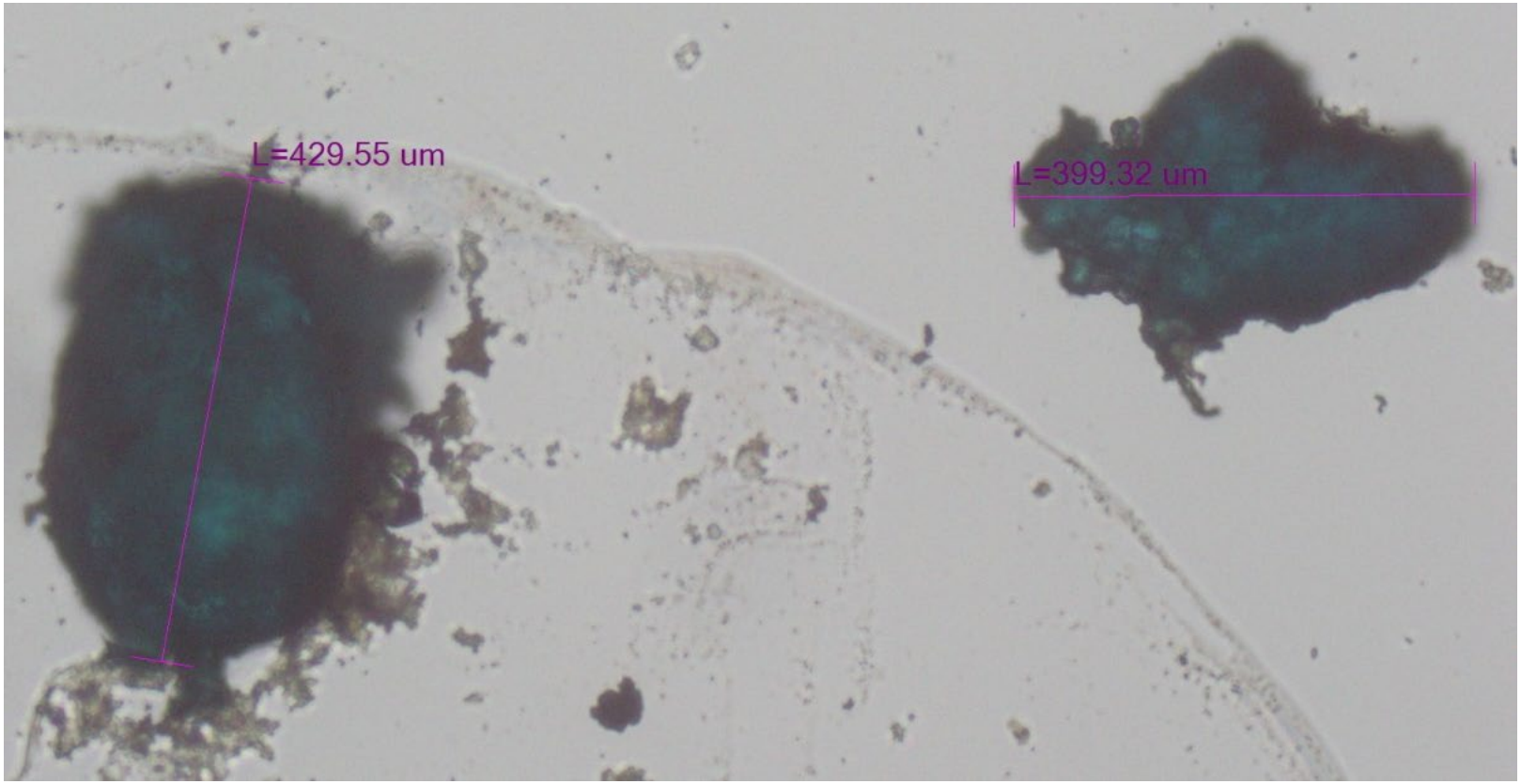
Microplastic from toothpaste



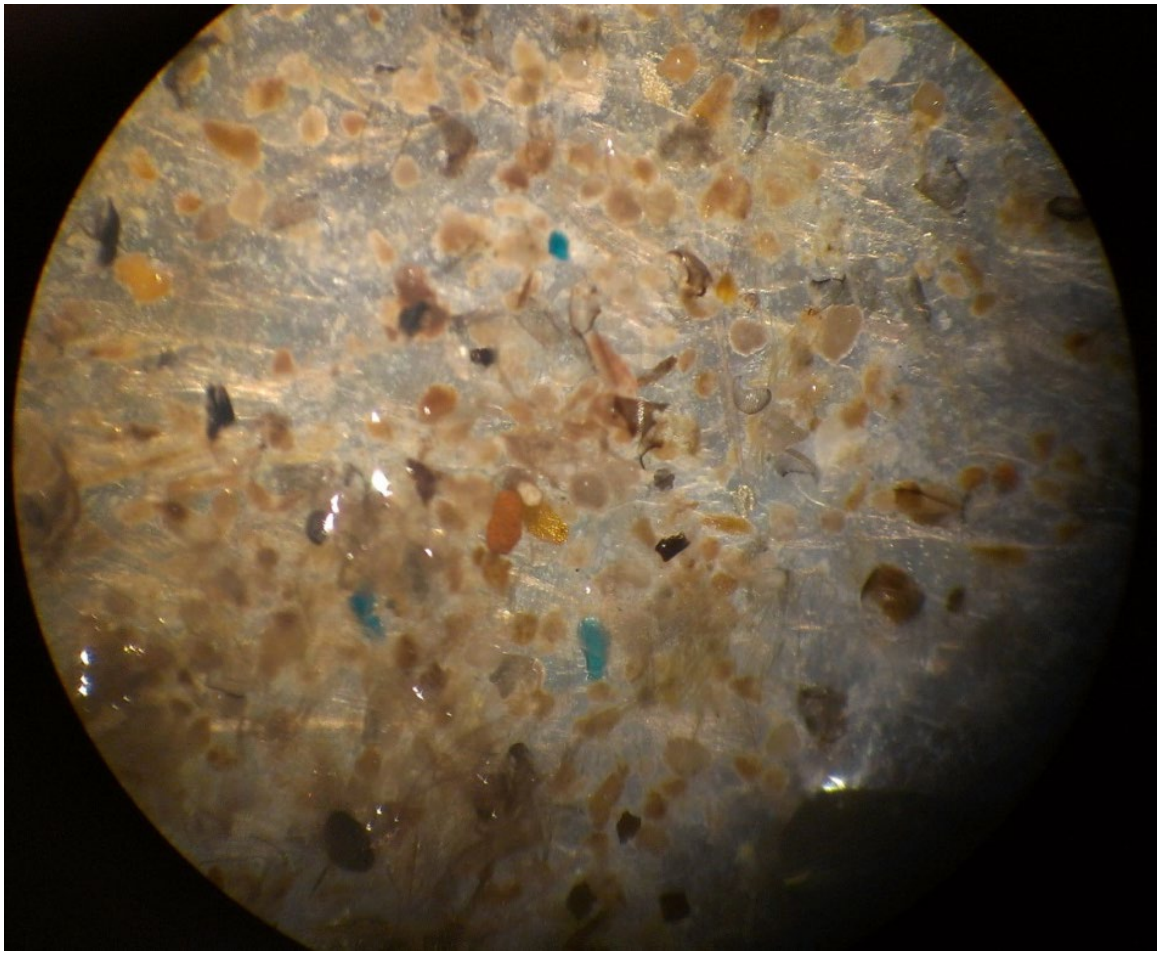
Biofilm



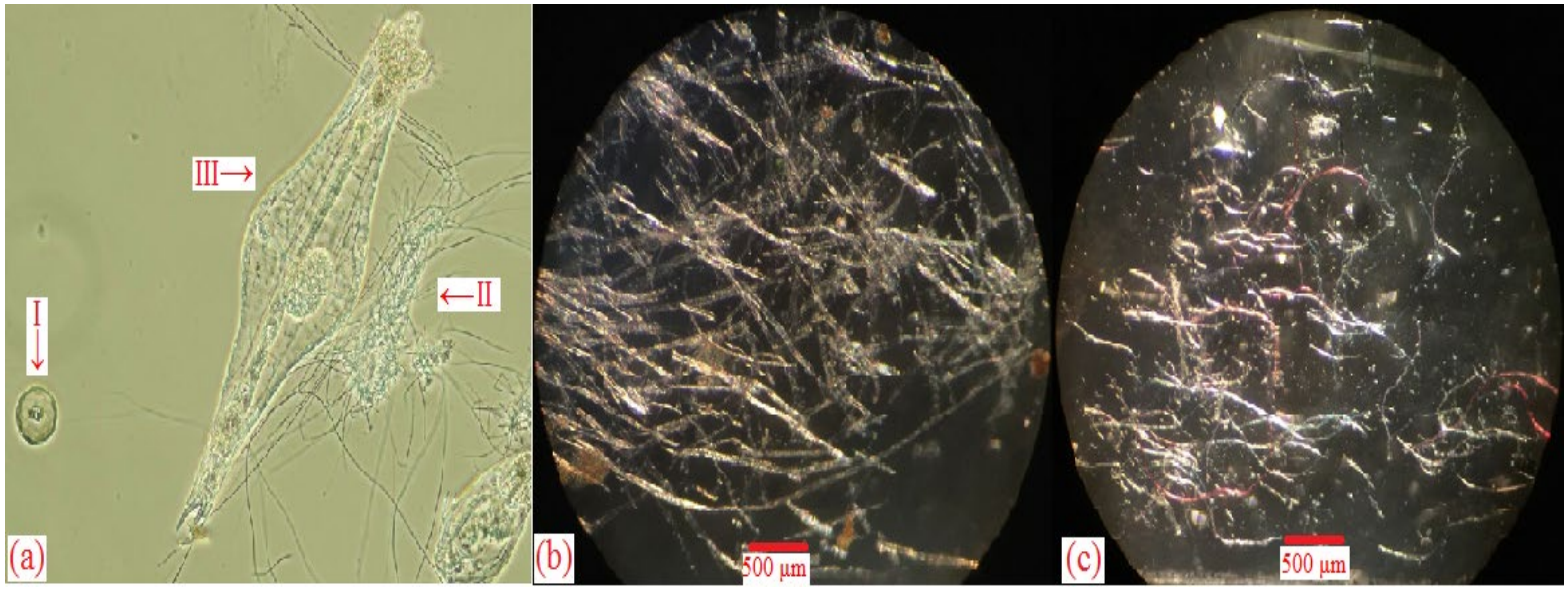
Surface biofouling



MPPs - Fats – Oil - Grease



Fiber Residues



(a) Bio-residues collected in the 45 µm sieve at WRP 6 when viewed under high magnification, I: Testate Amoebae, II: filamentous bacteria, III: rotifer. (b) Filamentous bacteria in 45 µm sieve residues at WRP 6. (c) Comparative fabric fibers (lint type taken from domestic washing machines) using similar magnification for (b).

Conclusions

- Field blanks must be utilized throughout sampling and associative processes
- Commercial standard sources be available (NIST)
- Consensus on reporting units: count, mass
- Preparative manipulations could change counts
- Fibers and particulate residues will likely require separate cleanup / enumeration methods
- Methods should not be bounded by preconceived notions
- Orthodox analytical routines may not be transferable

Thank You

QUESTIONS ?