Non-Purgeable Organic Carbon (NPOC), Total Inorganic Carbon (TIC), and Total Nitrogen (TN) in Waters and Aqueous Extracts

1. **Principle of Method:** This method measures the quantity of total organic carbon (TOC) as non-purgeable organic carbon (NPOC), and/or total nitrogen (TN) in water and soil extracts. NPOC is measured by acidifying an aliquot of water or soil extract using 1M HCl, then sparging the sample to strip off any purgeable organic and inorganic carbon. The sample is then injected into a combustion tube that is kept at 720°C containing platinum catalyst beads. A redox reaction occurs that evolves carbon dioxide gas (CO_2) which is then detected by a non-dispersive infrared (NDIR) detector for NPOC. To measure total inorganic carbon (TIC), an aliquot of sample is injected into a bubble chamber. Phosphoric acid (25 %) is added to the sample which reacts with inorganic carbon to form CO_2. Air is bubbled through the sample and the evolved CO_2 is sent directly to the NDIR detector for TIC analysis. For nitrogen analysis, the sample is combusted to NO and NO_2, then reacted with ozone to form NO_2 in an excited state. The resultant photon emission is measured by a chemiluminescence detector. Quantitation is achieved by calibrating the TOC instrument with known standard materials, i.e., potassium hydrogen phthalate for NPOC, sodium carbonate or bicarbonate for TIC, and ammonium or nitrate salts for TN.

2. **Instrumentation Used:**

   Shimadzu TOC-L CPH Model Total Organic Carbon Analyzer with an ASI-L and TNM-L. Manufactured by the Shimadzu Corporation, Analytical &Measuring Instrument Division, October **2015**, 145 Huashan Road, New District. Suzhuo, Jiangsu, China.

3. **References**:
   - **3.1** Total Organic Carbon Analyzer TOC-V User Manual, Shimadzu Corporation, Analytical & Measuring Instruments Division, Kyoto, Japan, 2001.
   - **3.2** Non-Purgeable Organic Carbon (NPOC): Shimadzu TOC-5050A Total Organic Carbon Analyzer, Dr. Mark W. Williams, Institute of Arctic and Alpine Research, University of Colorado, 2000.

4. **Standards Used:**

   4.1 QC Check Standard: Potassium hydrogen phthalate (KHP), certified solution (separate from TOC calibration standard solution).

   4.2 TN Calibration Standard: Potassium Nitrate, ACS grade.

   4.3 TOC Calibration Standard: Potassium hydrogen phthalate, certified solution.