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## A rapid total nitrogen determination prototype for wastewater treatment plants online detection

Jingxuan Geng<sup>1</sup>, Chunhua Yang<sup>2</sup>, Lijuan Lan<sup>3</sup>, Jie Han<sup>4</sup>, Fengxue Zhang<sup>5</sup>, and Yonggang Li<sup>6</sup>

<sup>1</sup>Central South University, China (gengjingxuan@csu.edu.cn)

<sup>2</sup>Central South University, China (ychh@csu.edu.cn)

<sup>3</sup>Central South University, China (lijuan.lan@csu.edu.cn)

<sup>4</sup>Central South University, China (hanjie@csu.edu.cn)

<sup>5</sup>Central South University, China (fengxuezhang@csu.edu.cn)

<sup>6</sup>Central South University, China (liyonggang@csu.edu.cn)

The online automatic detection for the concentration of total nitrogen (TN) is a critical problem in wastewater treatment plants (WWTPs). The over-discharge of TN can cause severe environmental problems such as aquatic eutrophication and ecosystem dysfunction, and the TN concentration in each wastewater treatment process can also reflect the processing statement of WWTPs and ensure its stable operation. However, determining the TN concentration timely is always a difficult task. According to the traditional TN detection approach, the concentration of TN is determined after the oxidative digestion process, which is a complex chemical reaction process and usually requires 30 minutes to 1 hour. Considering the actual operation situation, this traditional method can hardly satisfy the real-time requirement of WWTPs, which can only be used as a kind of validation approach. To solve this problem, in this paper, we design a novel automatic detection prototype of TN. Instead of determining the concentration of TN after the process of oxidative digestion, the ultraviolet spectrum is used to non-destructive detect the concentration of nitrate during the whole oxidative digestion process. Based on the principle of competitive response and chemical reaction kinetics, for different water samples with different TN concentrations, their oxidative digestion processes are different even in the early reaction stage. Therefore, we can use the early reaction properties to determine the TN concentration, thereby shortening the necessary detection time. Based on experimental data collected from real water samples, our prototype can not only efficiently shorten the detection time of the TN concentration, but also ensure satisfactory detection accuracy.