High-throughput DNA extraction method using SiNx Nanofilter device

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Isolation, purification and concentration of nucleic acids such as DNA and RNA are essential skills in various biotechnology. Because the sample pretreatment results can affect the downstream process, effective and fast sample pretreatment technology has been required. Nucleic acid isolation, purification and concentration methods have evolved over the past several decades. A nucleic acid extraction method widely used in the past is a process using a silica membrane or a magnetic bead. Conventional methods are time consuming and results vary depending on the user's proficiency. In addition, extraction of short nucleic acids such as microRNAs by a conventional method has the disadvantage of low efficiency and high cost. Therefore, the need for rapid, efficient and inexpensive isolation, purification and concentration of nucleic acids has increased in technologies such as molecular diagnostics and pathogen detection. There are several issues in the process of isolation, purification and concentration of nucleic acids, one of which is effective cell lysis. There are two ways to disrupt a cell: physical or chemical. Physical methods include bead beating and sonication, and chemical methods include cell lysis using a surfactant. The second is purification. When the ratio of the absorbance of light in the 260nm and 280nm ranges is measured, it is considered a pure nucleic acid when the DNA has a value of 1.8 and the RNA has a value of about 2.0. The third is concentration, which previously required the use of an ultracentrifuge method, such as density gradient separation, which is expensive and time-consuming to concentrate the sample. Here, we demonstrate a technique for selectively separating nucleic acids with high surface charge relative to their mass in an aqueous solution by electrophoresis method using multi-nanopore structure made of widely used conventional semiconductor processes.