

Abstract

# Microfluidic Enabled Portable ABO Reverse Typing Sensor †

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Blood typing is especially important in any emergency transfusion and during pregnancy. Transfusion of a non-compatible blood type can carry out severe health problems, since hemoagglutination reaction with opposite antibodies stick cells together.

Conventional blood typing test in most countries require direct and reverse blood typing. The second step, called reverse typing is done using the natural antibodies from the patient's plasma. The plasma of blood without cells is mixed with blood that is known to be type A and type B. Persons with type A blood have anti-B antibodies, and those with type B blood have anti-A antibodies. Type O blood contains both types of antibodies. The agglutination of the aforementioned cells will allow the determination of the blood type from the natural antibodies of patient's plasma.

Currently, this step is done in clinic labs since it requires a centrifuge to separate plasma from blood. This study presents an approach that combines a microfluidic a blood plasma separator and a paper-based blood type detector.

The proposed high throughput blood plasma separator device has been designed to use cross flow filtration in order to extract higher volume of plasma (0.1  $\mu\text{L}$ ) from fresh undiluted blood (2  $\mu\text{L}$ ) with high purity (100%) in an admissible time (5 min) to implement for blood typing tests.

The main advantage of this design is the efficiency and maximization of the amount of obtained plasma from initial sample. The results of this microfluidic system have been compared with commercial lateral flow assays to validate the quality and quantity of the extracted plasma and to prove its capability as a blood back typing input.

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