

Characteristic Measurements of Low Energy Atmospheric Pressure Plasma toward Protein Aggregation

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A low-energy atmospheric-pressure plasma (LEAPP) induces a rapid blood coagulation without thermal damage to tissues [1, 2]. In this blood coagulation, serum protein aggregation and hemolysis were observed [3-5]. From the LEAPP, there are several agents to react with blood, such as charged particles and reactive species. It is still not clear what agents play important roles in blood coagulation. In this presentation, we show our measured plasma characteristics and discuss the mechanism of blood coagulation and protein aggregation.

As a LEAPP source, an atmospheric-pressure plasma jet was used in this study. So far, we measured the following plasma characteristics; plasma-induced gas flow formation [6], production of reactive species [7], electrical characteristics [8], streamer propagation and striation phenomena [9,10]. Moreover, an effect of source gas was tested using He, Ar and those admixture.

We observed that the LEAPP using He and Ar produce almost the same kind of reactive species, except N_2^+ and each own species produced from the working gas. In electrical characteristics, the current waveform of the LEAPP using Ar was completely different from that using He, suggesting that the plasma production and transport could be different depending on the working gas. In the blood coagulation, there were several differences observed between He and Ar plasmas [1]. Therefore, we have conducted the plasma treatment to serum protein which is one of main blood components. To study the relation between the plasma characteristics and the degree of protein aggregation, experiments with different gas components for the plasma have been conducted. Figure 1 shows our experimental setup for the plasma treatment using different gas mixture ratio.

Experimental results and discussion for the relation between the plasma characteristics and the degree of protein aggregation will be presented at the conference.

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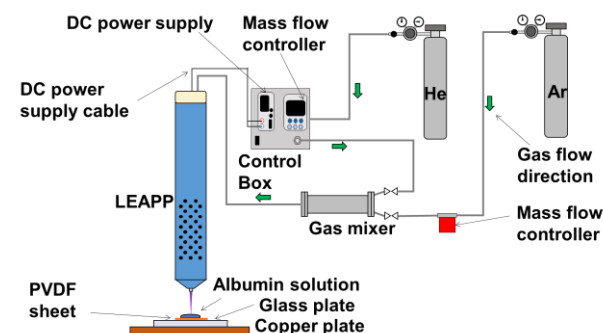


Figure 1. Experimental setup for plasma treatment to protein and controlling the gas mixture ratio.