THE AMOUNT OF WATER REQUIRED TO DECREASE THE CRITICAL TENPERATURE DIFFERENCE OF A STANDING WAVE THERMOACOUSTIC ENGINE

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Abstract

It is well known that the critical temperature difference needed for causing a thermoacoustic oscillation is decreased by the presence of water. R. Reilgh described in his book "Theory of sound"[1] that "the production of sound is facilitated by the vapor in the notice of glass-blowers" and the Kibitsunokama, which is used in Japanese ritual, can generate sound wave by using a rice-grain regenerator and water vapor[2,3]. Furthermore, D.Noda and Y.Ueda demonstrated that water vapor reduces the critical temperature difference from 290 to 56 degree C[4]. However, it has not been found how much water is necessary for the decrease of the critical temperature difference. In this study, we measured the critical temperature difference of a standing wave thermoacoustic engine as a function of the water mass added into the working gas. We increased the water mass from 0 g in increment of 0.05 g. As a result, the critical temperature difference was not changed in the range from 0 g to 0.15 g. On the other hand, when the water mass was 0.20 g, the critical temperature difference was decreased from 144 to 54 degree C. Therefore, it is found that the marginal value of the amount of water required to decrease the critical temperature difference exists. Moreover, we measured the marginal mass of water with changing material of a regenerator.

References

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