RECENT RESEARCH ACTIVITIES

Evaluation of NO_2 sorption ability of cedar wood

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Introduction

Nitrogen dioxide (NO_2) is a criteria air pollutant and affects human health, particularly the lungs and breathing passages. As representative materials for NO_2 removal, it is known that activated carbon, photocatalyst and terpenes from leaf oil have a high NO_2 sorption ability. However, use of these materials is limited by the problems of time-consuming production, decline in function depending on the weather and time, and waste liquid and residue disposal. Recently, it's known that Japanese cedar wood (*Cryptomeria Japonica*) has especially high NO_2 sorption ability compared with other wood species. Cedar wood is available itself as NO_2 removing material without any chemical or industrial treatment. Therefore, it has a great potential as a material for NO_2 removal. It is considered that NO_2 sorption ability of cedar wood is influenced by the structural features of tissues, moisture content and extractives. However, influences of each factor have not been evaluated in detail so far. We are trying to elucidate the influence on NO_2 sorption ability under various conditions focused on each factor by using a new system (Figure 1) for measuring NO_2 sorption volume developed by ourselves.

Experiment

In an incubator at 20±1 ˚C, Japanese cedar wood having different form and drying condition were aerated with concentrated NO_2 (1000 ppb, flow velocity: 560 ml/min). NO_2 concentration before and after passing through the specimens were monitored with a NOx monitoring devices. The amount of NO_2 sorption were calculated and compared among various specimens.

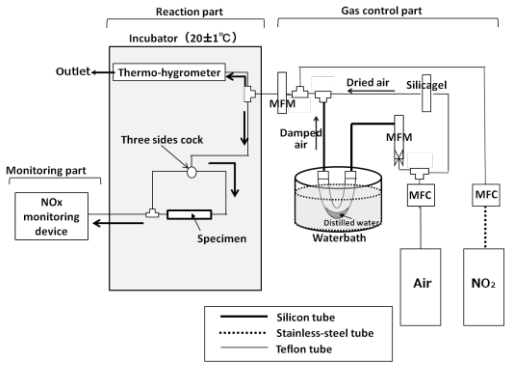

Figure 1. Experimental system for NO_2 sorption test. MFC means the mass flow controller which control flow rate. MFM means the mass flow meter which monitor flow rate [1)].

Results and discussion

When the NO_2 gas flowed over the surface of transverse section of specimen, the NO_2 sorption volume depended on the thickness of longitudinal direction and NO_2 sorption effect was high especially in the range of ca. 3 mm from the surface of transverse section. This range was almost same average length to the cedar tracheid. Also, NO_2 sorption volume depended on the interface area of the specimen which can contact with NO_2. These results show that the interface area which the structure of tracheid contributed was influenced to the NO_2 sorption ability. Furthermore, the average NO_2 sorption volume was the greatest in the specimen of natural drying and decreased as drying temperature was high. Because NO_2 sorption volume in extraction-treated specimen decreased to almost same values regardless of the drying temperature and it is reported that drying temperature is influenced to the amount of extractives in the wood by previous studies, the differences of amount of extractives by drying treatment seem to be influenced to the NO_2 sorption volume. We will examine the influence of moisture content as a next step.

Reference

[1] Miyuki Nakagawa, Akitaka Kimura, Kenji Umemura, Shuichi Kawai "Evaluation of NO_2 sorption of cedar wood with difference of the specimen size and contact condition between NO_2 gas and specimen using new test system", *Journal of Wood Science*, vol. 64, no. 3, pp. 318-325, 2018.