

RECENT RESEARCH ACTIVITIES

Evaluation of the VOC of Sugi (*Cyptomeria japonica*) wood on psychophysiological responses

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The volatile organic compounds (VOC) of wood are mainly sesquiterpenes and have strong physiological activities partly. The previous studies have reported that the VOC of several wood materials have the various effects on human body. In this study, we are trying to evaluate the VOC of sugi (*Cyptomeria japonica*) wood on psychophysiological responses. The purpose of our study is to make comfortable living spaces by wood and to increase utility value of wood.

Analysis of VOC in room with Sugi wood

To establish the analysis method of VOC emitted from Sugi wood in a living space, the experimental room of galvanized steel (inside dimension: W1560 × D1840 × H1975 mm) was used. The Sugi wood from Oguni (Kumamoto, Japan) was used as an experimental material. The material was dried at 45 °C and processed to vertical grained timbers (W105 × D12 × L1950 mm). Then, slitting processing was performed as shown in Fig. 1. The ceiling and walls of an experimental room was covered by the slitted sugi timbers. The VOC in this room were collected with a carbon tube (ORBO91T, Supelco, Bellefonte, PA) maintained at 25.8 ± 0.2 °C by applying a flow rate of 0.1 L min^{-1} for 3 h. The VOC were eluted by acetone and analyzed by a GC-MS system (GCMS-QP2010; Shimadzu Co., Ltd., Kyoto, Japan). The machine was equipped with an Ultra ALLOY-5 capillary column (30 m × 0.25 mm i.d., 0.25 μm film thickness; Frontier Laboratories Ltd., Fukushima, Japan). The temperature program was as follows: 50°C for 3 min, followed by increases of 10 °C/min^{-1} to 250 °C, and holding for 5 min. The other parameters were as follows: injection temperature, 250 °C; ion source temperature, 250 °C; carrier inlet pressure at 100 kPa; He at 1.69 mL min^{-1} ; injection volume, 1 μL. The GC-MS chromatogram of VOC emitted from Sugi wood were shown in Fig. 2. We compared the GC-MS data with mass spectral database library (NIST08) and previous study [1] for substance estimation. As a result, the VOC were mainly composed of α-cubebene, β-cubebene, α-muurolene, δ-cadinene and other several sesquiterpenes. We are just preparing to identify the compounds by retention index with *n*-alkanes and commercially available reagents. And then, we calculate the concentrations of the target compounds in the sample using the calibration standard line of these reagents.

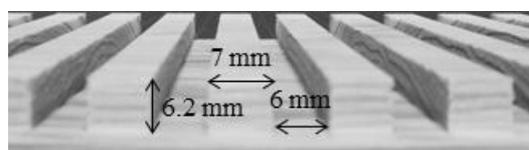


Fig. 1 Sugi wood materials with slitting

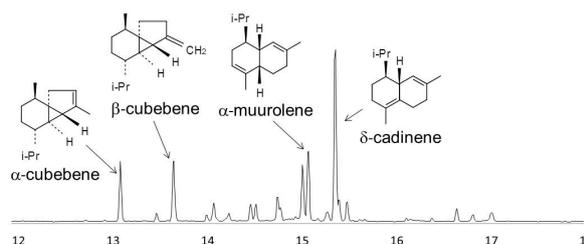


Fig. 2 GC-MS Chromatogram of VOC emitted from Sugi wood

Evaluation of VOC emitted from Sugi wood on psychophysiological responses

We are preparing to evaluate the influences on human body by breathing the VOC in the room with Sugi wood. The evaluation indices of human body are temporal changes of heart rate intervals and autonomic nerve activity as measured by electrocardiography, and subjective assessment for VOC, work performance with arithmetic work, salivary hormones.

References

[1] Ohira T etc "Evaluation of dried-wood odors: comparison between analytical and sensory data on odors from dried sugi (*Cyptomeria japonica*) wood", *J Wood Sci*, vol. 55, pp. 144-148, 2009.