Research Article:

EFFECT OF DIFFERENT FREEZING CONDITIONS UPON THE DIFFUSION COEFFICIENT OF SPRUCE WOOD

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Abstract:
The paper presents a study concerning the modifications induced by different freezing conditions upon the moisture diffusion in spruce (Picea abies L.) wood.

The diffusion coefficients in radial and tangential directions were determined at 20°C/35% and 40°C/35%, on wood samples initially subjected to rapid freezing (at -10°C/h freezing rate), respectively slow freezing (at -1°C/h freezing rate), then maintained for 1 week in frozen condition, comparatively to samples originating from the same log but stored in an open yard for three winter months (December-February) and also compared to non-frozen samples. All samples were subjected to the diffusion test after being dried to 12% mc.

These testing conditions were chosen so as to evaluate the influence of the freezing speed (rapid vs. slow freezing) and of the exposure duration to freezing conditions (1 week vs. 3 months) upon the moisture diffusion in spruce wood – which is an important property related to the dynamics of wood drying.

The results show that rapid freezing at -25°C do not affect moisture diffusion, while slow freezing (at a freezing rate of -1°C/h) and long-term exposure to negative temperatures increase moisture diffusion by 15-33% compared to unfrozen wood. The higher values were recorded in tangential direction and with the higher test temperature (40°C).

Key words: moisture diffusion; spruce wood; frozen wood.

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