

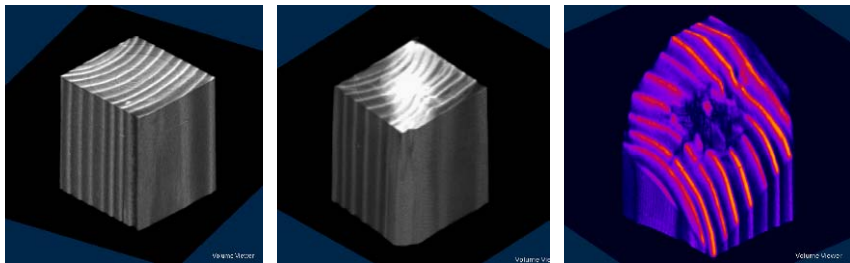
Investigation of compressed and formed wood using X-ray Tomographie (CT)

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Introduction

- Wood as a cellular material can be compressed under heat and pressure
- Reversible compression by using water and heat \mapsto manufacturing **TUBES**
- Varying Density during the process
- Comparing Spruce and Poplar

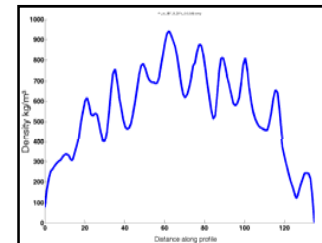
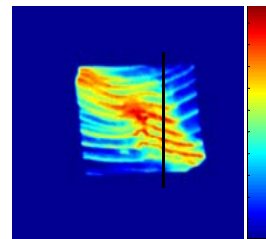
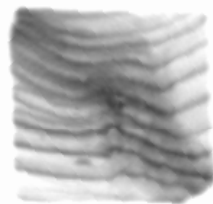


X-RAY CT: study changes in density during the process:

- *undensified*
- *densified with different amounts of compression*
- *recovering*

- **Method:** grey value based algorithm

$$\rho_x(\varphi) = (1 - \varphi) \cdot \rho_{\text{Holz}}(1500\text{kg/m}^3)$$



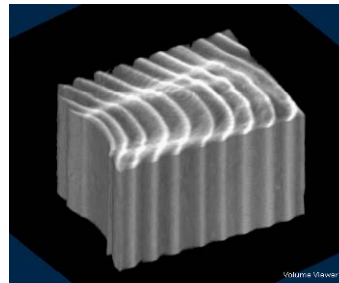
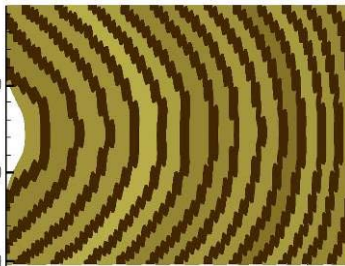
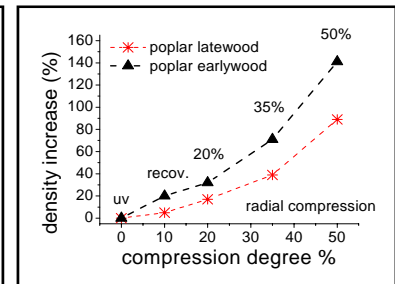
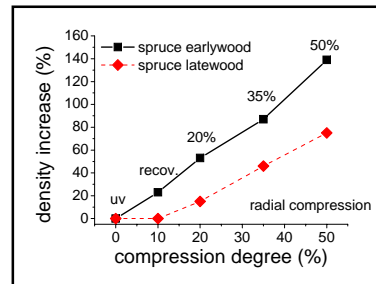
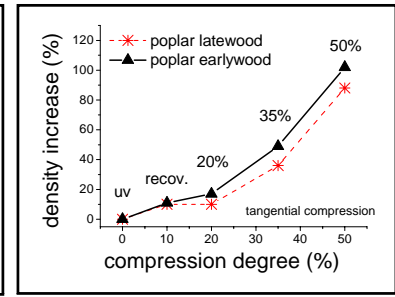
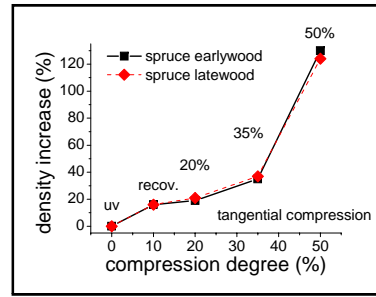
Results

- **Radial:** Poplar homogeneously compressed

- CT: most compression was inserted in earlywood, particularly in Spruce

- **Tangential:** both species were homogeneously compressed

- Density after storing in water showed incomplete recovery \rightarrow 15% higher



FE source: J. Matheas

- mesoscopical structure seems to be similar (fig. l. and m.)

- CT visualizes inner microstr. deformations (fig.r.)

\rightarrow **material constitutive law** for densified wood