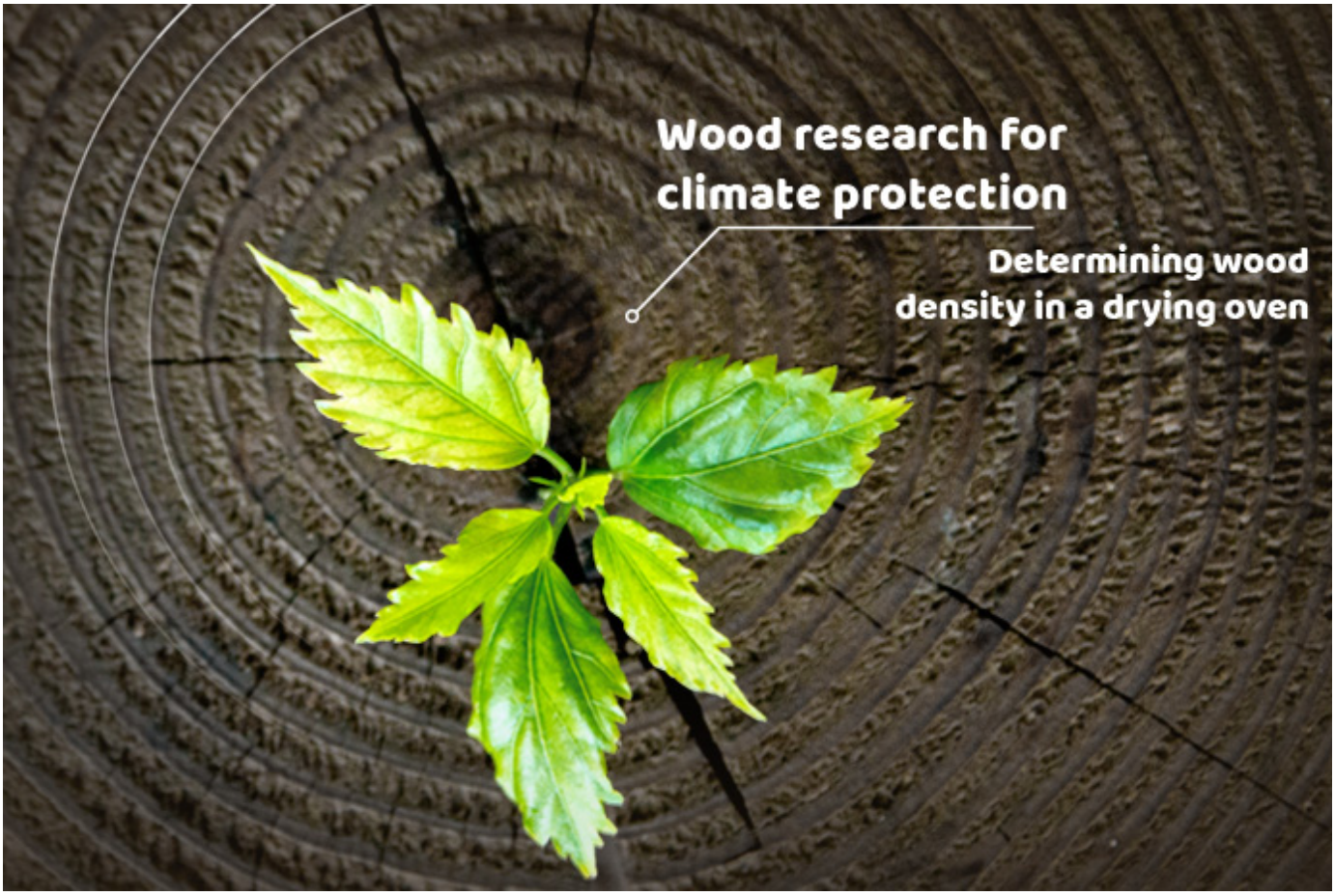

Determining wood density in a drying oven

The Royal Museum of Central Africa (RMCA) in the Belgian municipality of Tervuren is home to one of the world's most important wood collections (xylarium). The wood biologists at the AfricaMuseum use several Memmert drying ovens to quarantine wood samples and to dry wood in order to determine its moisture content using the kiln-drying method.

Memmert UF750plus drying oven for determining the density of wood

Determining a tree's age through annual rings

How do you determine a tree's age? The answer is dendrochronology. For trees growing at the same time in a given region, the distances between the annual rings will be largely identical, making it possible to identify how old the tree is to the nearest year. Certain conclusions about the

respective weather conditions can also be drawn from the study of annual rings. If a summer was cold or too dry, the annual rings will be narrower, while the better growth associated with wet and warm summers is reflected in broader annual rings. Dendrochronology is a relatively young scientific discipline, although the first descriptions of annual rings date back to antiquity. Wood biologists like Hans Beeckman, curator of the wood collection at the Royal Museum of Central Africa (RMCA) in the Belgian municipality of Tervuren, read the ages of trees by comparing the so-called annual-ring chronologies with wood samples dated previously. Beneficiaries include art collectors, archaeologists, wood scientists, and particularly climate researchers. Recordings now date back to the last Ice Age, and dendrochronology has even been used to date carbonised wood remnants from archaeological finds.

Sustainable forest management

By providing an insight into the past, the wood research team at the Royal Museum of Central Africa (RMCA) is making an important contribution to climate protection. Whether in a forest, in the home, or in a piece of furniture, wood binds huge amounts of carbon dioxide via photosynthesis and therefore makes a crucial contribution to climate protection. Since trees in tropical forests grow quickly, they also take up more carbon dioxide accordingly. It is estimated that 15 to 20 % of harmful emissions can be attributed to the depletion of tropical rain forests due to logging. This is why preservation of these forested areas in particular is such a major initiative for the future. The United Nations REDD+ programme wants to reduce greenhouse gas emissions caused by deforestation in developing countries by ensuring those farmers and people living on the land who choose not to get involved in logging are duly compensated. At the same time, research into sustainable forest management is being intensified – and this includes Hans Beeckman and his team at the RMCA. Key indicators here are carbon content and the C storage value, i.e. the capacity of wood to store carbon or bind CO_2. These are predominantly influenced by wood density, which is the main value for describing wood quality.

Trunk of an oak tree from the Spessart region – annual rings from 1545 to 1991

By User:Mattes (Own work) [Public domain], via Wikimedia Commons

Determination of the wood moisture content

Determining the 'density of wood' and carbon content

Wood density – or the weight of wood, to put it more simply – depends on the respective water content as wood is hygroscopic (i.e. it attracts water). Water content in turn is determined by the species of tree, its origins and location, and the conditions under which it has grown. Trees also store information about these conditions in their annual rings. For example, if a tree is growing in the mountains, its annual rings will be much narrower than a tree of the same species growing in a flatter area with warmer and wetter conditions. Wood density also varies within the same tree.

At the RMCA laboratory, the kiln-drying method is used to determine wood density and carbon content. Wood samples are weighed and then kiln-dried for a week in a UF750plus drying oven at 103 ? before being weighed again. The difference in mass is equivalent to the moisture in the mood. Using a special formula, the scientists calculate the wood density from this (kiln-dried density based on 0 % water content) and the carbon storage value or absorption expressed as tonnes of CO_2.

Memmert drying ovens are also used to quarantine newly arrived wood samples before these are added to the wood collection at the AfricaMuseum. They are stored for a few days at temperatures of 40 to 65 ? in order to kill off any parasites. The xylarium in Terverun is one of the world's most important wood collections and contains 63,000 wood samples from more than 13,000 species of trees. Given the potentially immeasurable damage caused by the parasites that can penetrate wood, the security of wood samples is paramount. In order to bear the weight of heavy wood samples, it is important for each drying oven to have a reinforced interior. Other important considerations that prompted the team at the AfricaMuseum to buy a UF750plus (the most recent drying oven they have purchased from Memmert) were the individual programming options and the adjustable electronic temperature monitoring.

AtmoSAFE thanks Hans Beeckman, a wood biologist at the

The IBT-Krämer Institute for Wood Technology recommends the drying oven method for the exact determination of the wood moisture content.

more information

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An overview of focus topics

- Dendrochronology
- Wood samples, tree species
- Tree annual rings, determining tree ages
- Wood drying, kiln-drying method
- Carbon content, carbon store, carbon cycle
- Xylarium, wood collection, wood database
- Density of wood, wood density
- Royal Museum for Central Africa, RMCA, AfricaMuseum
- Memmert, drying oven

Memmert laboratory appliances for drying

Drying oven UN and UNplus
Vacuum oven VO
Cooled vacuum drying oven VOcool

Autor: Memmert GmbH + Co.KG