

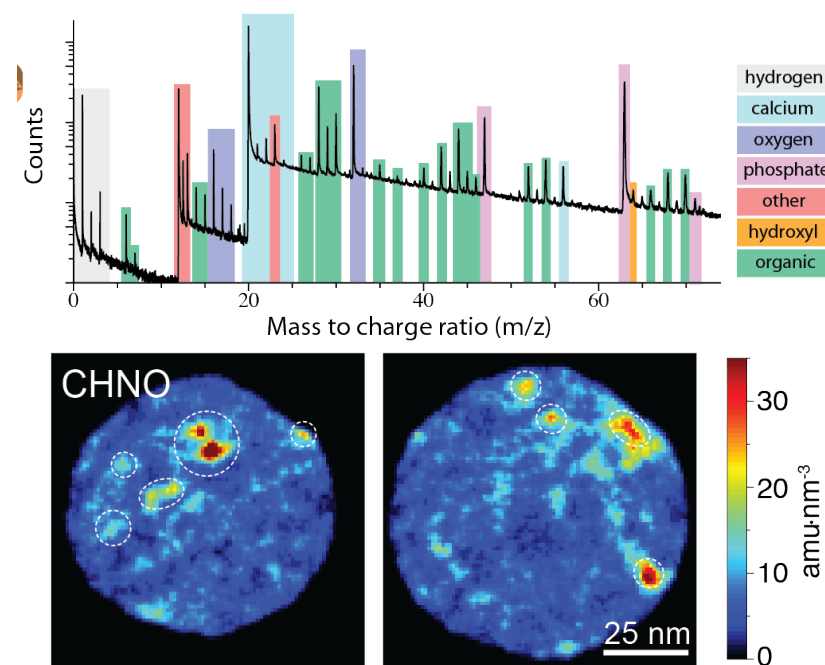


Atom-Probe Tomography of Apatites and Bone-Type Biomineralized Tissues



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Bone and dentin are composite materials that are of enormous importance to human health and quality of life. Apatite nanocrystals in bone-type tissues provide essential mechanical strength and acts as an enormous ion exchanger in our body. However, the nano-scale structural and chemical complexity of these tissues is extremely difficult to image. The Joester group made a breakthrough in chemical tomography of bone-type materials. Using laser-pulsed atom probe, the first atomic scale model of the chemical nanostructure of dentin comprising 12,000,000 atoms was created. This model revealed that collagen fibrils in dentin are chemically heterogeneous. This discovery has implications for our understanding of the synthesis of bone, its chemical and mechanical properties, and for developing bio-inspired approaches to bone-replacement materials.



Atom-probe tomography spectrum from a dentin specimen and two slices from the 3D reconstruction highlighting the fibrous nature of the organic component.

