

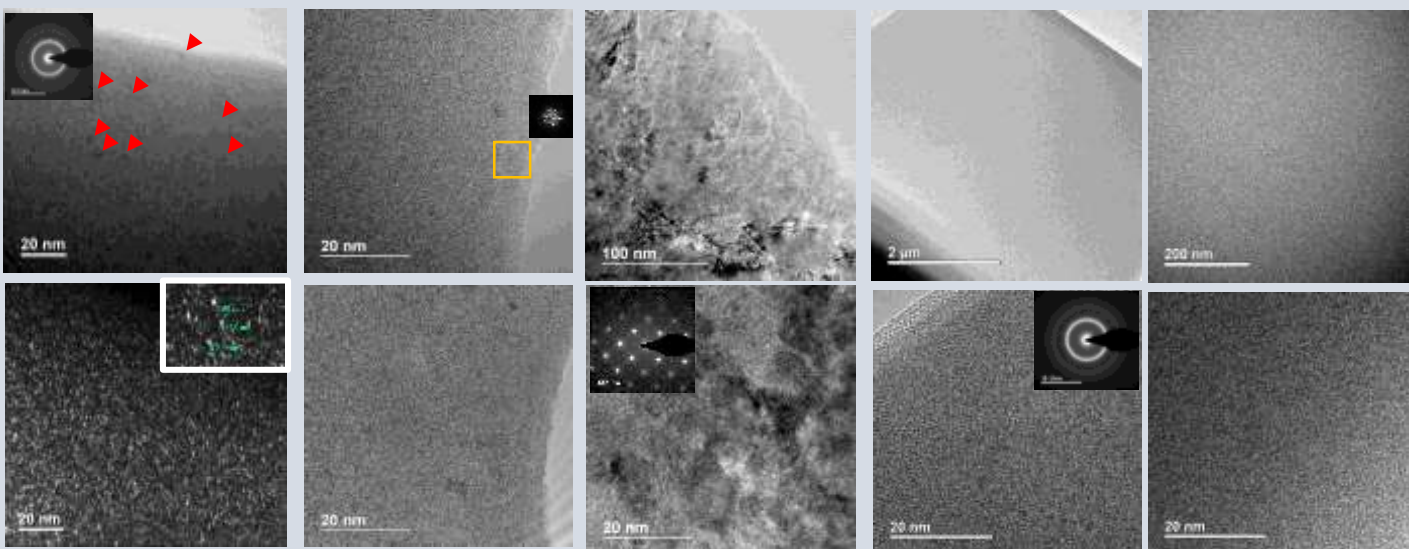
Fe-Cu-Nb-Si-B amorphous metallic alloys nanostructure

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In this work, amorphous metallic alloys of different compositions $\text{FeCu}_1\text{Nb}_5\text{Si}_{16.5}\text{B}_6$, $\text{FeCu}_{0.2}\text{Nb}_3\text{Si}_{16.5}\text{B}_6$, $\text{FeCu}_1\text{Si}_{16}\text{B}_6$ were investigated by methods of transmission electron microscopy (TEM), scanning transmission electron microscopy (STEM), and energy-dispersive X-ray microanalysis. Experimental results have shown that the presence of crystallites from 0.3 nm and other phase inhomogeneities is observed. The presence of inhomogeneity in the elemental distribution of copper in the studied samples is shown.

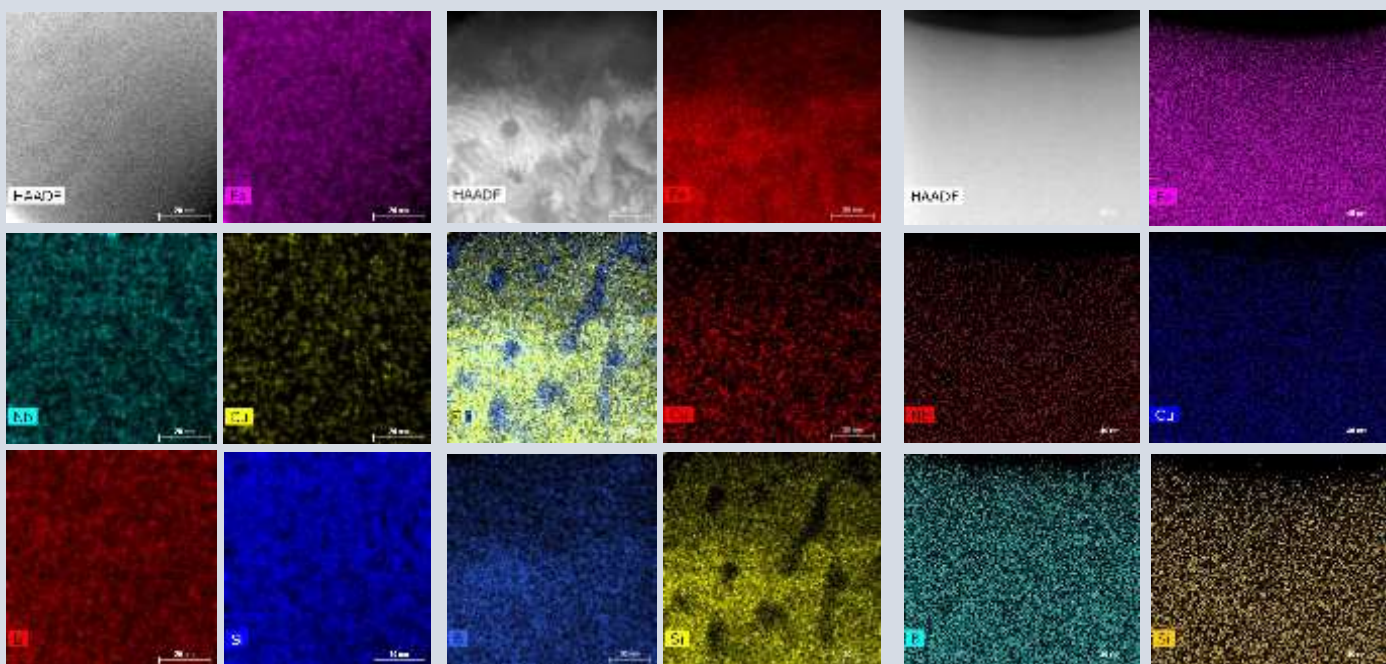


$\text{FeCu}_1\text{Nb}_5\text{Si}_{16.5}\text{B}_6$ TEM images

$\text{FeCu}_1\text{Si}_{16}\text{B}_6$ TEM images

$\text{FeCu}_{0.2}\text{Nb}_3\text{Si}_{16.5}\text{B}_6$ TEM images

The studies were carried out by transmission electron microscopy and scanning transmission electron microscopy on Tecnai Osiris and Tecnai G230ST microscopes at an accelerating voltage of 200 and 300 kV. Some of the samples were prepared by electrochemical etching, the second part was prepared by ion etching in a Gatan Duomill 600 setup at an accelerating voltage of 4 kV at the initial stage and 1.5 kV at the final stage after the hole formation to remove the damaged layer.



EDS map of element distribution in the $\text{FeCu}_1\text{Nb}_5\text{Si}_{16.5}\text{B}_6$ alloy

EDS map of element distribution in the $\text{FeCu}_1\text{Si}_{16}\text{B}_6$ alloy

EDS map of element distribution in the $\text{FeCu}_{0.2}\text{Nb}_3\text{Si}_{16.5}\text{B}_6$ alloy

The microstructure of alloys $\text{FeCu}_1\text{Nb}_5\text{Si}_{16.5}\text{B}_6$, $\text{FeCu}_{0.2}\text{Nb}_3\text{Si}_{16.5}\text{B}_6$, $\text{FeCu}_1\text{Si}_{16}\text{B}_6$ contains polycrystalline with grains size up to 100 nm. In the $\text{FeCu}_1\text{Nb}_5\text{Si}_{16}\text{B}_6$ and $\text{FeCu}_1\text{Nb}_5\text{Si}_{16.5}\text{B}_6$ alloys, Cu-enriched regions up to 2 nm in size appear. Electron diffraction studies have shown that the ordering is present in metallic glass alloys with the formation of two or more coordination spheres.