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MICROSTRUCTURAL STUDY OF HIGH STRENGTH ROLLED Zn-Cu-Ti ALLOYS

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The aim of the research is to define the microstructure required to obtain the better mechanical resistance after rolling of Zn-Cu-Ti alloys which composition range is 0.78 - 0.98% (in weight) for Cu and 0.12 - 0.18% (in weight) for Ti. These alloys have been rolled at the VM-AF (Vieille-Montagne - Asturienne France) rolling plant.

The typical microstructure of those Zn-Cu-Ti alloys in the rolled state is composed of $TiZn_{15}$ particles which align during rolling in the zinc matrix. In between round particules of $CuZn_4$ can also be found in the zinc matrix (Fig. 1).

Different types of microstructure have been observed :

- when the rolling conditions lead to dynamic recovery without any static recovery the final microstructre is fine and made of polygonized subgrains (grain size $\pm$ 1µm) (Fig. 2). In this case the mechanical properties required are obtained ;
- when the rolling conditions induce dynamic recrystallization without static recrystallization the microstructure obtained is also fine and the properties good. Fine grains (grain size $\pm$ 2µm) combined with C-axis texture induce high resistance (Fig. 3);
- static recrystallization must be prevented to avoid the formation of large grains detrimental for mechanical properties (Fig. 4) (grain size $\pm$ 5µm).

Careful control of the rolling conditions (temperature, reduction, speed of rolling) must be used to obtain the microstructure leading to the best mechanical characteristics.

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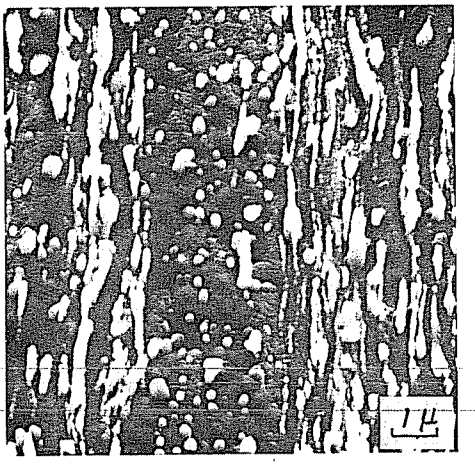

Fig. 1 - General structure of Zn-Cu-Ti alloys - MEB.

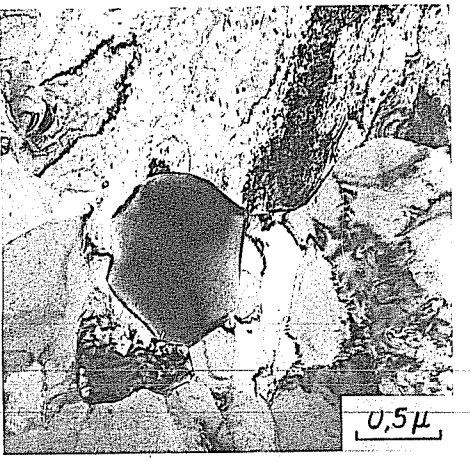

Fig. 2 - Microstructure of dynamic recovered alloys - TEM - R_M = 294 MPa.

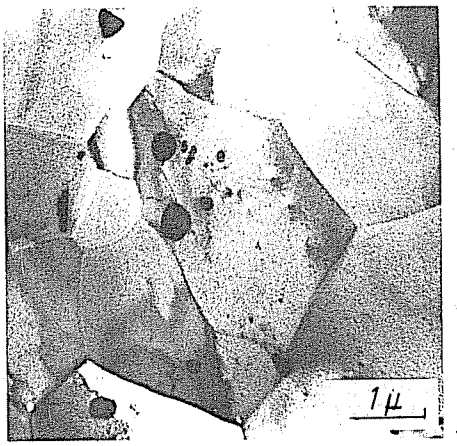

Fig. 3 - Microstructure of dynamic recrystallized alloys - TEM - R_M = 304 MPa.

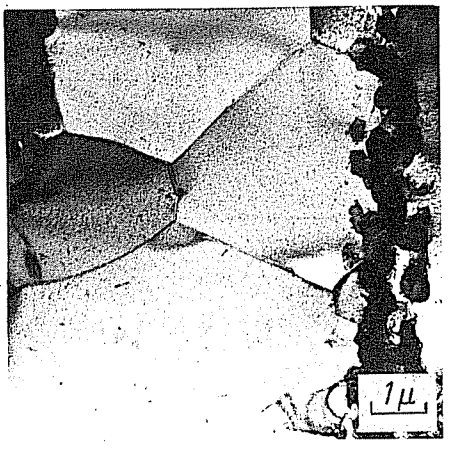

Fig. 4 - Microstructure of static recrystallized alloys - TEM - R_M = 219 MPa.