

# Utilisation of Fiber Sludge Refuse in Gypsum Fiberboards

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## The aim of the research:

- production of gypsum fiberboard based on secondary raw materials;
- elaboration of optimal water-gypsum (w) and fiber-gypsum (x) ratio using fiber sludge and lime sludge, flue gas desulfurization gypsum (FGD) or phosphor gypsum (PHO) and parallel formation of homogeneous internal board structure;
- characterization of the secondary raw materials above.

We have proofed that the secondary raw materials: the fiber sludge and the lime sludge from cellulose and paper mills are suitable for gypsum bounded fiber boards production using appropriate technology. The fiber sludge based gypsum composites open new possibilities in the field of mineral bounded composite.

## The properties of the fiber boards (Semi-dry process)

- At the semi-dry process it was clear, that the lime sludge supported to loosen the fibers at a relative high moisture content,  $u = 80-125\%$ .
- The precipitated lime sludge has bounding delay effect as well, so reduced amount chemical for delaying bounding is necessary.
- We have developed a fast mixing technology that resulted even higher homogeneity in the fiber-gypsum mixture (Figure 1).

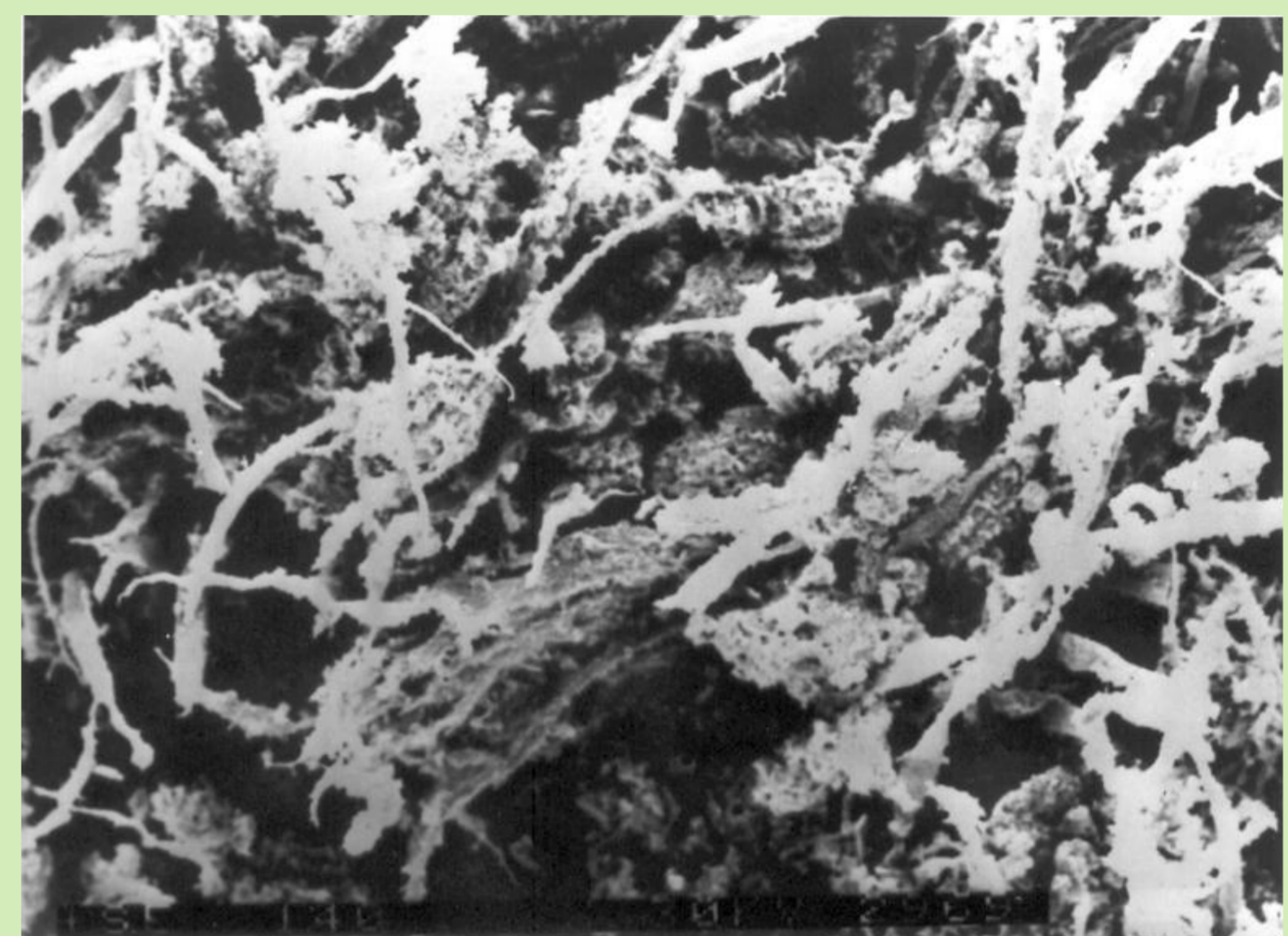


Figure 1. Board produced in semi industrial condition ( $x = 0.24$ ). (Amplification 140 fold)

## Some characteristics and material requirements of medium-high density gypsum-bonded fiber composites

Table 1.

Characteristic	Sasmax (Finland) Arborex (Norway)	Fermacell (Germany)	Würtex (Netherlands)	Fiber Sludge Boards
Structure of reinforcing material	flakes	wood pulps (recycled pulp)	waste paper	fiber sludge
Binders	gypsum hemihydrate	gypsum hemihydrate	gypsum hemihydrate	gypsum hemihydrate
Products	boards	boards	boards	boards (laboratory)
Density (g/cm <sup>3</sup> )	1.0 to 1.2	1.0	1.05 to 1.15	1.05 to 1.2
Bending strength (MPa)	6 to 9	4 to 7	5 to 7	4.5 to 7
Modulus of elasticity (MPa)	3000 to 5000	4000 to 5000	3000 to 5000	3200 to 4700

The Table 1 presents a comparison of properties and material requirements of available gypsum-bonded composites with those of boards which can be made from the above mentioned waste products.

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