Development of High-performance Kenaf Bast Oriented Fiberboard and Kenaf Core Binderless Particleboard

(Laboratory of Sustainable Materials, RISH, Kyoto University)

Shuichi Kawai

INTRODUCTION

The laboratory aims to establish the sustainable cycle of forest and forest products by developing the production, utilization and recyling/desposal system of wood biomass. New wood based materials and wood carbon composites harmonized with both global and regional environment are being developed by making use of the functions of wood as a cellular solid. The on-going research projects are 1) Fundamental methodology, machines and systems for producing the high-performance wood composites and wood composites with characteristic functions, 2) Environmentally Friendly Wood adhesives, and 3) Integrated projects such as life cycle assessment of wood composites, the preservation of wooden cultural properties, the aging of wood and prediction of service life of wood, and the sustainable production and utilization system of a large-scale plantation forest of acacia mangium.

One of the recent topics of the laboratory is the development of high-performance oriented kenaf bast fiberboard and kenaf core binderless particleboard.

KENAF BAST ORIENTED FIBERBORAD AND KENAF CORE BINDERLESS PARTICLE-BOARD

Kenaf (*Hibiscus cannabinus* L.) is a fast-growing annual plant. The stalk consists of a thin outer layer of dense bast fibers with an inner of light core. The kenaf bast fiber provides extremely high strength, which can be converted into a high- performance medium density fiberboard (MDF). Whereas the core is extremely light with a density of 100-200 kg/m^3, which is suitable material for producing low-density board.

The oriented medium density fiberboard (MDF) from kenaf bast fibers was manufactured with newly developed pilot-scale equipment. The oriented MDF with a density of 800kg/m^3 provides 2-3 times higher in mechanical performance than plywood. The MDF is now commercialized and used as a bearing wall.

The binderless particleboards from kenaf core with a density range from 200 to 650 kg/m^3 were successfully developed by using a steam-injection press. The bonding performance of the binderless boards was excellent while the board density were relatively low. The mechanical performance of binderless boards was improved with increasing the steam pressure and the longer pressing time contributed to the better dimensional stability. The chemical changes and self-bonding characterization of kenaf core is also investigated.

Figure shows the kenaf bast oriented MDF (top), kenaf core binderless particleboard (middle), and the composite panel of kenaf MDF as faces and the core binderless particleboard as a core (bottom).