導入鐵道用 木材枕木의 解剖學的 識別

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Anatomical Identification of Imported Cross Tie Woods for Rail Road in Korea

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Conclusion

The greater parts of rail road cross tie woods used in Korea have been supplied by imported woods from Philippines, Malaysia, Indonesia, Formosa, Japan, and the United States of America.

However these imported woods are impossible to accomplish effective preservative treatment for the prolongation of use life, their anatomical properties which is indispendsable for the identification and utilization have not investigated. Accordingly this study was carried out to investigate the anatomical characters and identification method of imported cross tie woods for the accomplishment of reasonable preserving treatment.

The important studies on the anatomical properties and identification of woods in Korea were carried out at the period of Japanese regime before liberation by Yamabayashi, Dr. and professor of wood technology, formerly in College of Agriculture and Forestry, Suwon, Korea, and thereafter by authors. Among the above studies anatomical properties of imported cross tie woods in this country were reported by one of the authors (1959, 1961, 1962, 1969) under the cooperation of Technical Laboratory, Ministry of Transportation, 1960–1961, and under the direct support of Ministry of Education, Republic of Korea in 1969.

Sixteen wood species were selected and prepared. They were obtained from the piling sites in preserving plants, located at Suwon and Pusan Korea. Selected species are Keruing, Kapur, Kempas from Malaysia and Indonesia; Apitong from Philippines, Schima, Machilus, Cyclobalanopsis and Castanopsis from Formosa; Red oak, White oak, Elm, Hickory, Beech, Douglas foir and Western hemlock from U.S.A., Beech from Japan.

The items of macroscopical (general) features, which were observed and examined principally, are the annual rings, transitions from spring to summerwood, pore types and arrangements, sap and heart-woods, wood colors, odor and tastes, wood textures, resin ducts, parenchymas, and rays. The microscopical items such as vessels, tracheids, wood fibers, ray cells, parenehyma cells, and intercellular cannals were observed and measured, too.

The observed and measured results were synthesized. Accordance with these investigated properties, macroscopical and microscopical keys were made for wood identification as follows.

I. Key for the identification by macroscopical features

1. Pores visible on cross surface 3
1. Proes not visible on cross surface (Pores not present) 2
   2. Annual rings very distinct and wavy sometimes. Transitions spring to summerwood abrupt generally but incline to gradual in case of wide annual rings. Sap and heartwoods clearly distinct: sapwood light yellow or light reddish white; heartwood light reddish yellow, orangish red, or light red. Normal vertical resin cannals visible on cross surfaces . . . . . Douglas fir
   2. Annual rings distinct. Transitions spring to summerwood, incline to gradual. Sap and heartwoods not distinct. Wood colors light brown to light yellowish brown at the parts of summerwood and white at the several annual layers near bark. Normal vertical resin cannals not visible on cross surfaces . . . . . Western hemlock
3. Pores show definite arrangements regularly 10
3. Pores show not definite arrangements, but irregular diffuse 4
   4. Pores show relatively large. Transitions spring to summerwood pores show non-transition completely 3
   4. Pores relatively small or very small. Transitions spring to summerwood pores show very gradual, or gradual to non-transition 5
5. Pores relatively small. Transitions spring to summerwood pores show very gradual to non-transition 7
5. Pores not visible without lens because very small. Transitions spring to summerwood pores show very gradual 6
   6. Sap and heartwoods clearly distinct, sapwood shows white and heartwood white tinged with red to reddish brown . . . . . American beech
   6. Sap and heartwood indisinct. Wood colors show yellowish brown to yellowish brown tinged with light red . . . . . Japanese beech
7. Wood has yellow color when green but changes into dark reddish brown by seasoning, and also heavily odor and taste but reduces significantly by seasoning . . . . . Schima
7. Wood has no odor and taste at all, even textured, and reddish brown colored . . . . . Machilus
   8. Vertical resin cannals not visible (Vertical resin cannals not present). Pores medium sized. Sapwood shows light yellowish white and heartwood orangish red . . . . . Kempas
   8. Vertical resin cannals visible on cross surfaces. Pores very large 9
9. Sapwood shows light yellowish white and heartwood light reddish brown. As usually resin traces flowed from resin cannals distinctly visible on cross surfaces . . . . . Apitong, Keruing
9. Sapwood shows light yellowish white and heartwood light reddish brown to reddish brown. Resin traces not visible on cross surfaces . . . . . Kapur
   10. Pores show ring porous arrangement 11
   10. Pores show radial porous arrangement 15
11. Ring porous arrangement nearly completes, and pore arrangement layers show one to several rows . . . 12
11. Ring porous arrangement shows in parts of springwood only and radial porous arrangement in summerwood zones. Wood colors yellowish white to yellowish brown . . . . . Castanopsis
   12. Pores very large, and wood textures very coarse 13
   12. Pores more or less large, and wood textures fine to coarse 14
13. Arrangement layers of ring porous show one to four rows. Broad and narrow rays distinctly visible without lens on cross surfaces. Pores in heartwood occluded heavily by tylosis. Sap and heartwoods clearly distinct,

sapwood shows white to light brown and heartwood light yellowish brown to light brown or dark brown ..... White oak

13. Arrangement layers of ring porous show one to three rows. Broad and narrow rays distinctly visible without lens on cross surfaces. Tylosis not visible in pores at the parts of heartwood. Sap and heartwoods clearly distinct, sapwood shows light brown to light reddish brown and heartwood light red to reddish brown in color ..... Red oak

14. Arrangement layers of ring porous show one row. Rays visible as lineal (narrow) type. Sap and heartwood distinct, sapwood grayish yellow to light brown and heartwood light brown to brown in color ..... American elm

14. Wood rays visible as lineal (narrow) type. Sapwood white to light brown and heartwood light brown to reddish brown in color ..... Hickory

15. Arrangement layers of radial porous show one to three rows. Broad and narrow rays distinctly visible on cross surfaces. Sap and heartwoods distinct, sapwood light yellowish red and heartwood reddish brown to dark reddish brown in color ..... Cyclobalanopsis

II. Key for the identification by microscopical features

1. Vessels not present 2
1. Vessels present 3

2. Wood is composed mostly of tracheids. Narrow rays two types, uniseriate and fusiform; uniseriate rays lineal; fusiform rays contain in their central part horizontal resin cannal one or two. Normal vertical and horizontal resin connals present. Pits,leading from ray parenchyma to longitudinal tracheids fusiform, 1 to 6 small pits per ray crossing. Ray tracheids nondentate ..... Douglas fir

2. Wood is composed mostly of tracheids. Rays uniseriate, 1 to 16 plus cells height. Normal resin cannals wanting, pits leading from ray parenchyma to longitudinal tracheids cupressoid, 1 to 4 small pits per ray crossing. Ray tracheids nondentate ..... Western hemlock

3. Vessels (pores) show definite arrangements on cross sections 4
3. Vessels (pores) show not definite arrangements but diffuse on cross sections 9

4. Pore arrangements show radial porous. Vessel perforations (plates) simple. Parenchymas arrange as paratracheal (vasicentric) and metatracheal. Rays homogenous or heterogeneous, visible as uniseriate, biseriate and aggregate rays. ..... Cyclobalanopsis

4. Pore arrangements show ring porous. Rays appear as homogeneous, or homogeneous with heterogeneous 5

5. Rays appear as homogeneous with heterogeneous 3
5. Rays appear as homogenous only 6

6. Metaseriate (4 to 6 seriates wide) rays appear but uniseriate rays not present. Spiral thickenings visible on the small diameter vessels of summerwood. Vascular tracheids present ..... American elm

6. With uniseriate, metaseriate (broad) rays present. Vasicentric tracheids visible around pores, and gelatinous fibers appear sometimes 7

7. Broad rays show 12 to 30 seriates (150 to 400 microns) in width, and attain to 12.7mm in height. Tylosies in pores not visible ..... Red oak
7. Broad rays show 12 to 30 seriates (150 to 400 microns) in width, and attain to 25.4mm in height. Tylosies in pores heavily developed ..... White oak

8. Arrangements of vertical parenchymas show metatracheal, diffuse or terminal. Perforation plates of

vessels simple. Gelatinous fibers visible . . . . . Hickory

8. Arrangements of vertical parenchymas show metatracheal, and terminal. Perforation plates of vessels visible as simple but scalariform on the summerwood vessels . . . . . Castanopsis

9. Vessel pores very small or medium sized on cross sections 10

9. Vessel pores very large on cross sections 14

10. Pores medium sized. Vessel perforations simple. Parenchyma arrangements show confluent, alieform and diffuse on cross sections. Rays appear as metaseriate with uniseriate, and heterogeneous .. Kempas

10. Pores small sized. Vessel perforations scalariform, or simple with scalariform 11

11. Vessel perforations show scalariform only. Vertical parenchymas arrange as vasicentric on cross sections . . . . . Machilus

11. Vessel perforations show simple with scalariform 12

12. Solitary and multiple pores appear. Multiple pores 2 to 3 radial seriates. Rays heterogeneous, and uniseriate rays appear but biseriate generally . . . . . Schima

12. Pores show solitary as usually. With metaseriate(broad), unseriate rays appear 13

13. Rays homogeneous, but sometimes show upright cells at the ends of rays . . . . . American beech

13. Rays heterogeneous as usually, and visible crystalliferous cells in the ray parenchyma cells . Japanese beech

14. Vessel perforations simple. Vertical parenchymas arrange to vasicentric, metatracheal and terminal. Vertical resin cannals included in the vasicentric parenchymas disperse, but sometimes 2 to 3 each resin cannals arrange tangentially on cross sections. Rays appear as heterogeneous . . . . . Apitong, Keruing

14. Vessel perforations simple. Vertical parenchyma arrangement shows vasicentric, alieform, confluent, metatracheal or diffuse. Vertical resin cannals arrange circumferentially within metatracheal parenchyma layers. Rays appear as heterogeneous . . . . . Kapur

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