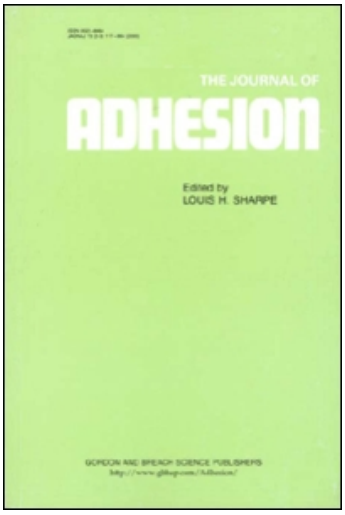

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A Brief Account of Adhesive Use in the Wood-Based Panel Industry of China

Zhen-Yuan Sun[a]
[a] Institute of Wood Industry, Chinese Academy of Forestry, Beijing, People's Republic of China

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A Brief Account of Adhesive Use in the Wood-Based Panel Industry of China

ZHEN-YUAN SUN

Institute of Wood Industry, Chinese Academy of Forestry, Beijing. People's Republic of China

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Background and present situation

As China is a developing country, its wood-based panel industry is also developing. The annual output of wood-based panels was 690,000 m^3 in in 1981, and the amount of adhesives utilized in their manufacture was about 40,000 T annually of which 70–75% was amino resins, 15–20% was phenol resins, and the rest was protein binders.

In developing a wood-based panel industry, our government has adopted the policy of developing enterprises mainly on a medium or small scale. At first these enterprises were concentrated in a few main industrial cities; later they expanded to several main wood-producing areas such as the northeast, the southwest, the southeast, and the south centers of China.

In China, most adhesive production is associated with the larger wood-based panel plants. The adhesives plants also supply adhesives to other small wood-based panel plants in the area. The types of ad-

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hesives produced are determined by the supplies of raw materials available and the demands for them. Therefore, wood adhesives production is on a small scale and has little variety. In order to improve the quality of production and solve problems in processing, many technicians are engaged in research on testing and applying wood adhesives in these plants. It appears that research on wood adhesives is being emphasized by the government.

The Research Section of Wood Adhesives was set up in the Institute of Wood Industry, Chinese Academy of Forestry, in 1958 by the Ministry of Forestry. The main research units of wood adhesives are the following: Research Section of Wood Adhesives, Institute of Wood Industry, Chinese Academy of Forestry; Research Section of Wood Adhesives, Institute of Chemical Processing Industries of Forest Products, Chinese Academy of Forestry; Sections of Teaching and Studying, related to wood-based panels, College of Forestry Industry of Nanking, College of Forestry of the Northeast; Institutes of Wood Industry of both Beijing and Shanghai; Institute of Forestry of Sichuan province, and so on. In addition, in some large enterprises there are many technicians who are engaged in the testing, improvement, and application of adhesives. In other departments, such as the chemical department, the light industry department, and the architectural and building materials department, research on wood adhesives is also done. In addition, the government will import advanced technology on wood adhesives for the wood-based panel industry according to production needs.

Our research on wood adhesives is closely connected to wood-based panel production and is quite technical. With the development of our wood-based panel industry, progress in adhesives research is divided into the following stages. Early in the 1950's, research was mainly on protein binders for the Chinese plywood industry. From the late 1950's to the mid 1960's, studies on synthetic resin adhesives were started, along with the development of the wood-based panel industry. But because of the shortage of chemical raw materials, studies were made on manufacturing the adhesives from biological resources as well as utilization of by-products and wastes from industries so that the binder resource was broadened. Some research associated with specifications and standards for wood-based panels was also done at that time. In recent years, the wood-based panel field has diversified and production facilities have been renovated. Further studies on synthetic adhesives have been conducted to improve the quality and increase the quantity

and performance of these panels. Preparations have been made for basic research work in some units using reliable technology.

Recent research activities

As mentioned above, the wood-based panel industry is just developing, and there must be great progress in synthetic adhesives to satisfy the needs of this industry. Recently many research units have been studying synthetic adhesives, especially amino resins, from different angles. In concert with the technical renewal of the plywood industry, the scientists in our country are studying the tack of UF resins. We studied and prepared a modified UF resin with melamine and got good results. We trial-produced a special UF resin for particleboard to accelerate the development of our particleboard industry. The UF resin helps increase productivity and improve processing conditions because the resin has good gluing strength, fast curing speed, and low free formaldehyde. We tried to prepare this special binder for an MDF plant we designed which has an annual output of 10,000 m^3, and got good preliminary results.

In addition, we studied extenders from by-products of forestry and agriculture, such as sesbania powder, tannin, acorns, walnut shells, and larch bark in an attempt to fully utilize the natural resources and save resin, and to make better plywood. Some of these by-products have already been put into production. We studied the emulsification of phenol resin and prepared an emulsion which can be acid cured and produces plywood with good wet strength. It is best used in gluing wood species from south-east Asia, which have high acidity. As for the hot melt technique, we have trial-manufactured EVA Hot Melt and nylon string covered with EVA for edge bonding of boards used in the furniture industry, splicing in plywood production and overlaying with PVC film.

In summary, through these studies we have discovered methods for renovating out-of-date equipment in order to diversify the product mix, make quality products, and increase productivity in the wood-based panel industry.

In China, the idea of producing adhesives from biological resources has long been valued. Early in the 1950's, Chinese scientists conducted studies on the utilization of natural lignin and its derivative, polyphenol, and rosin from forestry and furfuraldehyde from agriculture in wood adhesives. Recently we finished several research projects including,

"Preliminary study on rosin-phenolformaldehyde resin as binder used in particleboard from flax" and "Lignosulfonate as binder used in fiberboard and particleboard." Additionally, we engaged in research work on the utilization of enzymes to dewax petroleum. We are also studying the effects of sesbania powder and cassava on soybean binder to broaden this resource.

We are also studying the utilization of PVAc emulsion in the wood industry. Earlier we used PVAc emulsion in the furniture industry instead of protein binders. Recently we studied binary and tertiary emulsions of PVAc and used them to glue veneer to wood-based panels. We also utilized EVA emulsion in edge bonding of panels for furniture and got good results.

As you see, our wood adhesives researchers have obtained some good results and have been conducting a great deal of research. The technology utilized in this research is not yet fully developed, however, and varies from area to area within China.

Prospects

Based on the present insufficient supply of some chemical raw materials and the needs of the wood-based panel industry, we will be putting a greater emphasis on the research of synthetic resin adhesives, especially amino resins, in the next five years. We will diversify UF resins, developing a special UF adhesive for each type of wood-based panel. We will improve UF resin to increase its gluing strength and water resistance and to lower the amount of dissociated formaldehyde in the processing of wood-based panels as much as possible. We will be attempting to accelerate the curing rate of PF resins and conduct basic research on the use of synthetic resins for wood bonding. In producing wood adhesives, we will modify plant equipment and concentrate on producing adhesives and improving the conditions of wood adhesives plants. In utilizing chemical products from forestry, we will continue to study the utilization of tannin, natural lignin and its derivatives and rosin in wood adhesives for use in the production of wood-based panels.

In all these fields we must learn from the advanced experience of other countries, combined with our technology, to develop the Chinese wood-based panel industry. I am using this opportunity to ask the advice of specialists in these fields. Hopefully we can initiate an international exchange of ideas.