and equipment, optimize the pharmaceutical environment; the control technology connected with the whole tablet production line is the future development trend; in domestic pharmaceutical enterprises, medium speed tablet machine is still: he mainstream equipment, high speed, high efficiency tablet machine is not required by Chinese pharmaceutical enterprises, but the goal of the pharmaceutical industry to improve the efficiency [1, 2].

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DEVELOPMENT TREND OF DRUM MILLS

The origin of roller mills can be traced back to ancient times. As early as the Neolithic era, humans began using stones and wooden sticks to grind grains, which can be considered the most primitive form of mills. Over time, mill designs evolved. Mill technology advanced significantly during the Industrial Revolution, and in the early 1800s, the first modern drum mill was introduced, using a metal drum instead of the traditional stone mill. This innovation greatly improved the efficiency and quality of grinding.

At the beginning of the 20th century, as industrialization accelerated, the design and function of drum mills continued to improve. Engineers began to investigate ways to optimise the shape, material and speed of the drum to suit different types of raw materials and product requirements. After the Second World War, the range of applications for drum mills expanded rapidly, from the initial processing of grains to a wide range of industries, including ore processing, chemicals and building materials.

In recent decades, with the development of automation technology and material science, the performance and efficiency of roller mills have made another qualitative leap. The introduction of computer control systems has made the operation of mills more precise and efficient, while the application of new wear-resistant materials has significantly extended the service life of the equipment. Drum mills (such as rod mills and ball mills) play an important role in the mining and material processing industries. With the advancement of technology and changes in market demand, the future development trend of drum mills is mainly reflected in the following aspects:

1. Technological innovation and intelligence

– Intelligent control: In the future, drum mills will increasingly adopt intelligent control systems to achieve automated operation and real-time monitoring. This will improve production efficiency, reduce labor costs, and reduce the occurrence of human errors.

– High-efficiency materials: The application of new wear-resistant materials will improve the durability and work efficiency of drum mills and reduce maintenance costs.

2. Environmental protection and energy saving

- Green manufacturing: With the increasingly stringent environmental regulations, the design and operation of drum mills will pay more attention to environmental protection, reduce energy consumption and waste emissions. For example, more efficient grinding media and optimized grinding processes are used to reduce energy consumption and improve resource utilization.

- Waste recycling: In the future, drum mills may integrate waste recycling systems to reuse waste generated during the grinding process, further promoting sustainable development.

3. Changes in market demand

– Demand for high-quality products: As the industry's demand for highquality powder materials increases, drum mills need to continuously improve their crushing accuracy and product quality to meet the high standards of the market.

- Diversified applications: The application areas of drum mills will continue to expand, not only limited to the traditional mining and building materials industries, but will also penetrate into the chemical, pharmaceutical, food and other industries to meet the specific needs of different fields.

4. Large-scale and complete equipment

- Large-scale trend: In order to improve production efficiency, future drum mills will tend to be large-scale, able to handle larger-scale materials and improve overall production capacity.

- Complete equipment solutions: As the market demand for complete equipment increases, drum mill manufacturers may provide more complete solutions, including pre-treatment and post-treatment equipment, to meet customers' one-stop needs.

5. Competition and cooperation

- Industry integration: As market competition intensifies, the drum mill industry may see a trend of integration, and smaller companies may be acquired by large companies to enhance market competitiveness.

– International cooperation: Cooperation between domestic and foreign companies will increase, especially in technology research and development and market expansion, to improve the overall industry's technical level and market share.

Looking ahead, the drum mill market is expected to continue its steady growth trend. By 2030, the global market size will be close to the USD 10 billion mark, and the compound annual growth rate (CAGR) is expected to remain around one percentage point for the next six years. This forecast is based on the analysis of market demand in key regions across the globe, including North America, Europe, Asia Pacific, South America, and the Middle East & Africa.

In terms of product type, the market share of single two-tank and single four-tank is expected to continue to grow, reflecting market demand for highperformance and multi-purpose mills. In terms of applications, the chemical industry will continue to dominate, with growth expected in other applications such as power, agriculture and laboratories.

Notably, the Chinese market is expected to grow at a rate higher than the global average, thanks to domestic companies' investment in technological innovation and product development, as well as national policy support for related industries. In addition, the U.S. and Europe, as mature markets, are also expected to maintain a stable growth trend in the coming years.

With the advancement of industrial automation and intelligence, drum mill technology continues to innovate, and the efficiency and stability of the equipment has been significantly improved. Modern drum mill adopts more efficient transmission system and wear-resistant materials, effectively reducing energy consumption and maintenance costs. At the same time, the application of intelligent control system makes it possible to monitor and adjust the grinding process in real time, thus ensuring the production efficiency and product quality.

In terms of new mill technology, the emergence of equipment such as vertical stirred mills and energy-efficient cylinder roller mills marks the development of grinding technology in the direction of more efficient and energysaving. Vertical stirred mill improves the precision of crushing force and enhances the selective grinding of minerals through the grinding action mainly supplemented by slight impact action, which is especially suitable for the field of fine grinding. The cylinder roller mill combines the energy-saving effect of roller press, the compact structure of vertical mill and the operational reliability of ball mill, and significantly improves the grinding efficiency by squeezing the ground material for many times.

The competitive landscape of the global drum mill market is becoming increasingly fierce, with major manufacturers consolidating their market position through technological innovation, market expansion and product diversification. According to QYResearch, the global drum jar mill market reached sales of billions of dollars in 2023 and is expected to double by 2030. In this process, some of the major manufacturers are playing a key role in the growth of the market through their product reach and market share.

The global market is dominated by companies such as Gilson, Ceramic Instruments, Paul O. Abbe, MRC Lab, and Sassuolo Lab. These companies have established a strong brand presence globally through continuous product innovation and market expansion. For instance, Gilson has gained a reputation in the global market for its high-quality drum mill products, which are widely used in a variety of applications such as chemical, power, and agriculture. Ceramic Instruments, on the other hand, has captured a share of the market with its expertise in the field of mills for ceramic materials.

The drum mill market has experienced significant growth over the past few years and is expected to continue this growth in the coming years. Technological advancements, demand for environmental protection and energy conservation, changes in the competitive landscape of the industry, and expansion of application areas are the major factors driving the market. Continuous technological innovation provides a strong impetus for the development of the drum mill market. Modern drum mills effectively reduce energy consumption and maintenance costs by adopting more efficient drive systems and wear-resistant materials. Meanwhile, the application of intelligent control systems makes it possible to monitor and adjust the grinding process in real time, ensuring production efficiency and product quality. The global drum mill market is becoming increasingly competitive, with major manufacturers consolidating their market position through technological innovation, market expansion and product diversification. Meanwhile, SMEs are gradually challenging the market position of traditional giants through technological innovation and market segmentation. In addition, cross-industry competitors, such as electronics and software companies, have begun to enter the mill market, bringing new competitive pressures. The application areas of drum mills are expanding, and in addition to the traditional mining and chemical industries, other application areas such as power, agriculture, and laboratories are also expected to grow. With the development of downstream industries, the demand for drum mills is becoming more and more diversified, which provides a wide scope for further growth of the market.

The future development trend of drum mill will be affected by many factors such as technological innovation, environmental protection requirements, and changes in market demand. Enterprises need to keep up with the pace of industry development and actively carry out technological research and development and market layout to maintain their advantages in competition Overall, the future development of the drum mill market is promising, but it is also facing challenges such as increasing market competition and rising environmental requirements. Industry participants need to continuously innovate and adjust their business strategies to adapt to the rapid changes in the market and the diversification of customer demands. The government and industry organizations also need to continuously improve policies and regulations to provide a good external environment for the healthy development of the industry.

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ИССЛЕДОВАНИЕ ПРОЦЕССА ОБРАЗОВАНИЯ ЭМУЛЬСИЙ ИЗ НЕСМЕШИВАЮЩИХСЯ ЖИДКОСТЕЙ

В настоящее время существует проблема с хранением и транспортировкой многофазной жидкости с сохранением физико-химических свойств эмульсии. Эмульсия – это дисперсная многофазная система состоящая из двух или более несмешивающихся жидкостей, например, вода и нефть, вода и масло [1]. Эмульсия не может быть бесконечно стабильной с точки зрения законов физики-химии, т.е. эта жидкость расслоится и разделится со временем. Поэтому нужно поддержание стабильности на протяжении ее срока эксплуатации, хранения, транспортировки. В зависимости от типа эмульсии при расслоении продукт может стать очень жидким или очень густым, что влияет на потребительские свойства конечного продукта. Это особенно актуально для промышленности, получение битумных материалов, пропиточных композиций, изготовление средств по уходу за кожей, смазочно-охлаждающие жидкости для обработки металлов, где многофазные системы широко используются.

Образование эмульсий может происходить при смешивании жидкостей с помощью механических или химических методов в различном оборудовании [2-4]:

1. Механический способ - эмульгирование с помощью гомогенизаторов, мешалок и эмульсоров различных конструкций и т.д.

В гомогенизаторах жидкая смесь продавливается под высоким давлением (до 35 МПа) через отверстия сечением около 10-4 см² или через узкий кольцевой зазор специального клапана.