高分子材料微型加工设备

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摘要：高分子材料加工实验常用的加工设备，如：螺杆挤出机、混炼机、注塑机、纺丝机等，均为大型加工设备，涉及原料消耗大、操作要求高、实验耗时长等问题，很难让学生独立开展此类加工实验。实验室立足经济、环保、方便、快捷、操作简单等理念，利用本学科成熟的材料加工技术和设备设计技术，自主设计开发自有知识产权的微型加工设备，单次用料仅需 5~10g，即可开展高分子材料共混、拉丝、拉膜、注塑加工实验。学生通过简单培训，即可独立操作微型加工设备，开展高分子材料加工研究。

关键词：微型共混仪；微型注塑机；高分子材料；加工工艺

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Micro Processing Equipment for Polymer Materials

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Abstract: The commonly used processing equipment for polymer material processing experiments, such as screw extruders, mixers, injection machines, spinning machines, etc., are all large processing equipment that involve high raw material consumption, high operational requirements, and long experimental time. It is difficult for students to independently carry out such processing experiments. Based on the concepts of economy, environmental protection, convenience, speed, and simple operation, the laboratory utilizes mature material processing technology and equipment design technology in this discipline to independently design and develop micro processing equipment with its own intellectual property rights. With a single material consumption of only 5-10g, experiments on polymer material blending, wire drawing, film drawing, and injection can be carried out. Through simple training, students can independently operate micro processing equipment and conduct research on polymer material processing.

Keywords:micro mixer; micro injection machine; polymer materials; processing technology

1 微型加工设备组成

微型加工设备使用少量原料即可开展多种加工实验，制备不同形状及用途的样品。微型共混仪和微型注塑机如图 1 所示。

微型双锥共混仪

微型注塑机

图 1　微型加工设备照片

1.1 微型共混仪

微型共混仪是集高分子材料共混改性、熔融纺丝、流延成膜一体化的加工设备。设备采用双锥混炼螺杆及螺旋型混炼室以提高混炼效果，可以对高分子材料（如 PP、PA、PET 等）及其共混物进行加工研究。

1.2 微型注塑机

微型注塑机用主要适用于高分子材料或复合材料的各种样条的制备，如拉伸样条、冲击样条、弯曲样条、流变样条等制作，以便对所研究的材料进行进一步的测试。可以和微型共混仪配合使用，也可单独使用，特别适合于大专院校和研究机构的材料性能研究。

2 微型加工设备技术特点

2.1 微量化整体设计

1）微量原料使用：微型共混仪单次投料 5~10g，即可开展高分子材料的混炼、挤出加工实验。微型注塑机料腔容积 20ml，每次投料 5~10g，即可开展高分子材料的注塑实验。