Using waste polyethylene for 3D printing

Polyethylene is among the most widely used polymers. It is inexpensive, highly durable and can be readily processed into rigid packaging such as bottles as well as flexible packaging as films. It is also sturdy and inert, and is not readily degradable. Therefore, used polyethylene forms a large part of the non-biodegradable component of the waste stream, especially in urban settings. Some of this waste polyethylene is recycled through formal and informal routes. However, this typically results in downcycling of the polymer into lower value applications. The use of rigid high density polyethylene for 3D printing applications would represent a significant value addition. This was precluded by the tendency of high density polyethylene (HDPE) to warp. In the group of Dr Guruswamy Kumaraswamy at the CSIR-National Chemical Laboratory, research funded by the Department of Science and Technology had established a laboratory method to create novel 3D printable formulations based on polyethylene. Through the INAE Abdul Kalam Technology Innovation Fellowship, this work was extended to the field and we were able to demonstrate a scaled-up process for the preparation of 3D printable HDPE filaments, derived from waste HDPE. This process is simple and robust and can be implemented in low resource settings such as city garbage processing centers. This technology holds promise to provide a lucrative income stream for conservancy workers and to integrate them into the sophisticated waste-to-wealth economy.