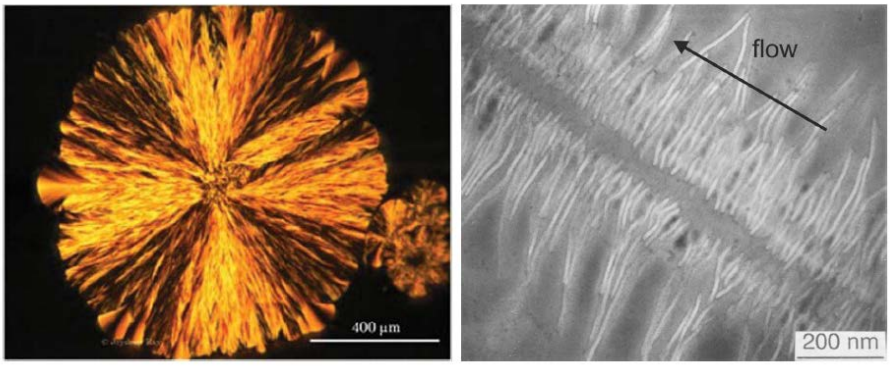
MSc Project

Flow induced structures in PEEK?

Polyetherether-ketone (PEEK) is increasingly used as matrix material in thermoplastic composites for it's exceptional stiffness, chemical resistance and applicability in a wide temperature range. In turn, PEEK composites are installed in aerospace application for weight reduction purposes, where fiber loading and orientation thereof dominate the mechanical properties of the part.

It is well known that thermoplastics, under strong flow conditions and during cooling from the melt, may form oriented crystal structures, such the particular shish-kebabs in the figure below. These crystals shapes have, similar to the added fibers in composites, exceptional properties in the orientation direction. Due to the high molecular chain stiffness of PEEK, it is not easy to form such features and current literature is inconclusive.



Crystals can grow in spherulitic shapes not only in polymers, but also in chocolate (left). An example of oriented shish-kebab structures in polyethylene (right).

In this MSc research, you will use various experimental methods to investigate flow-induced crystallization of PEEK, aiming to further tune the properties PEEK composites. Steps include:

- A literature study on crystallization in thermoplastics and suited experimental methods
- Designing an experimental plan (using rheology, optical microscopy, X-ray diffraction, thermal analyses, or …)
- Performing the experiments and analyzing the results
- Development/adjustment of modeling tools (Matlab) to describe (flow-induced) crystallization
- Provide process guidelines and summarize outcome in a scientific report

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