



# Surface topography evolution during finish rolling of sheet steel produced using metal peeling

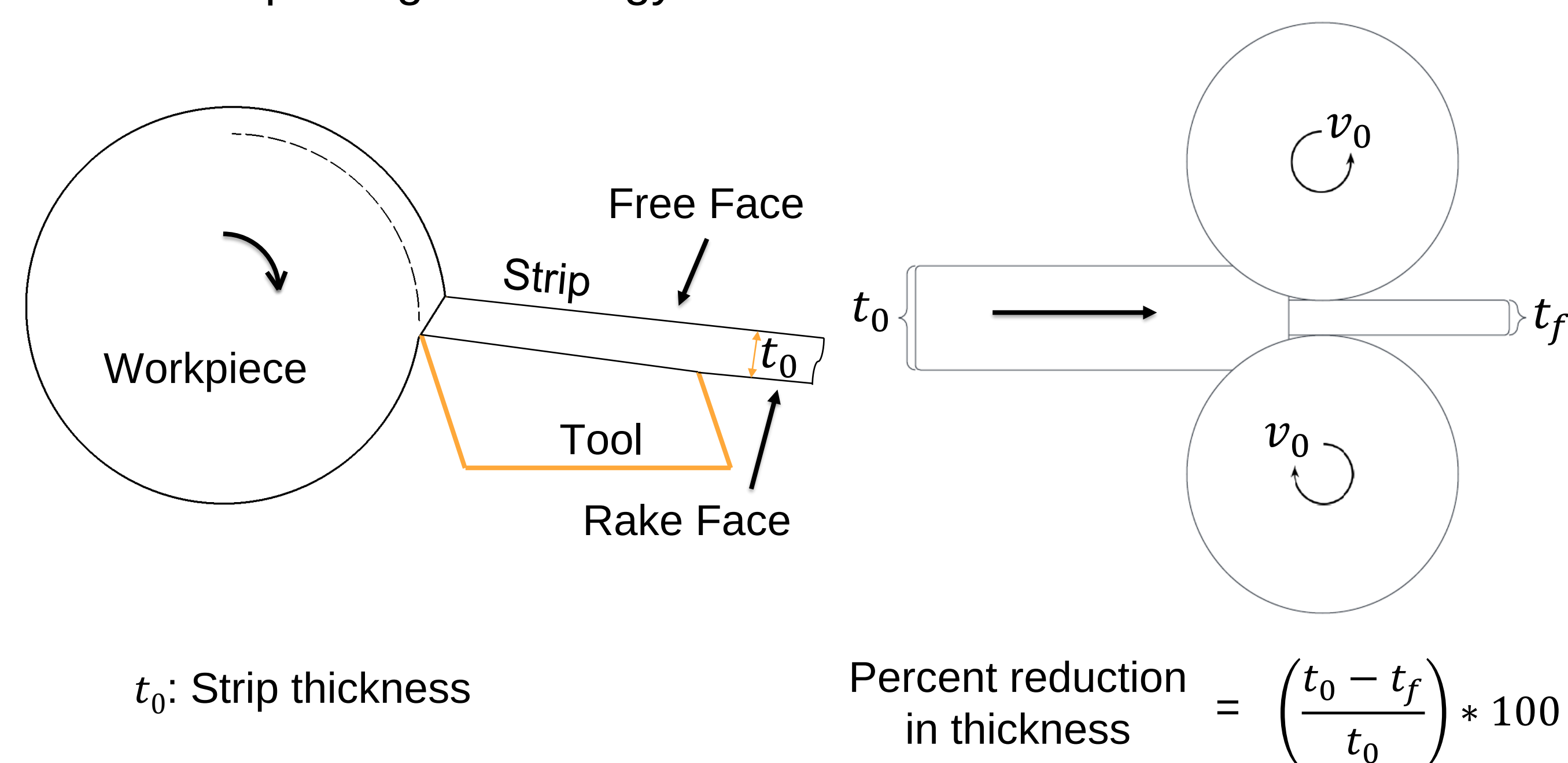
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## Introduction

**Metal Peeling** is an alternative method for production of sheet metal. It produces sheet in a single step – by peeling a thin layer of sheet metal from a rotating feedstock. Metal peeling enables significant reductions in energy usage and carbon emissions over the conventional rolling technology.

**Objective:** To understand how surface topography evolves during the post-processing (finish rolling) of steel strip that is produced by metal peeling technology

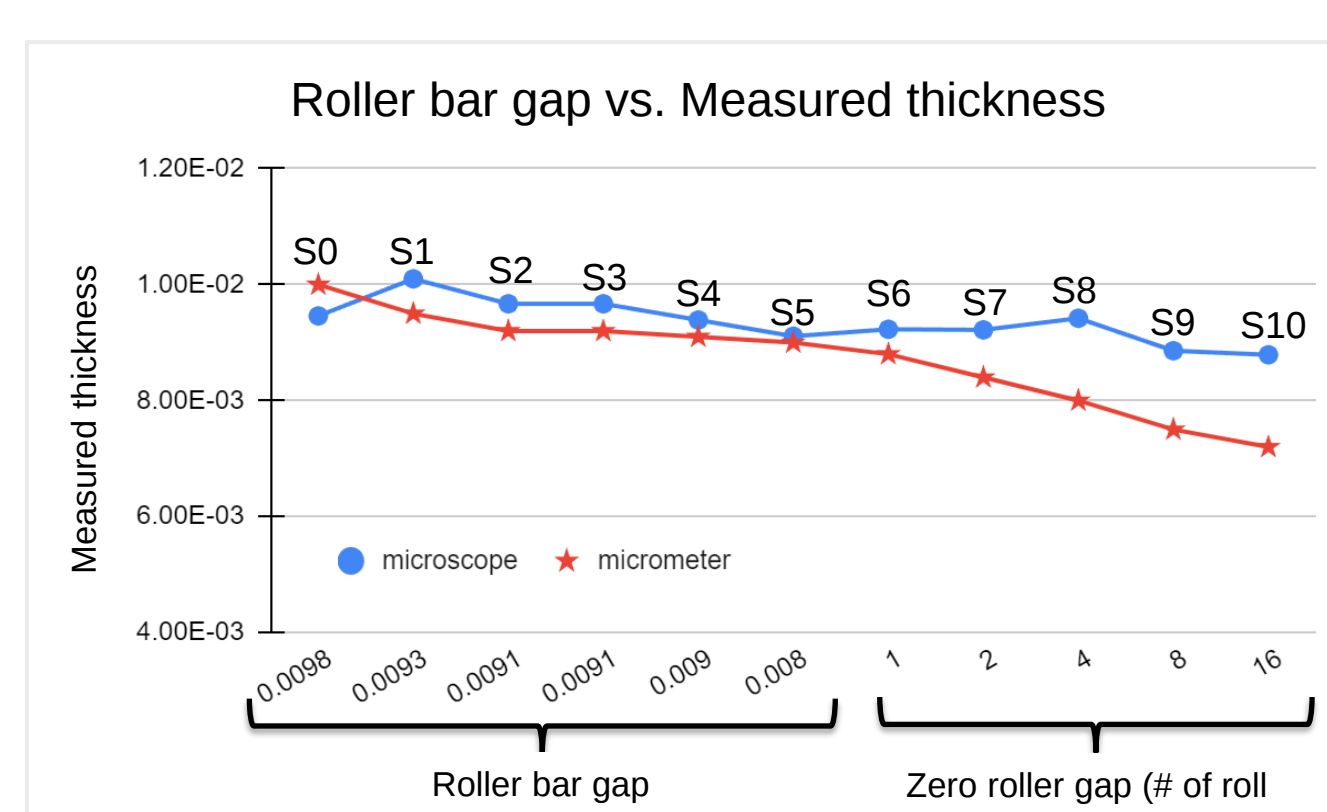
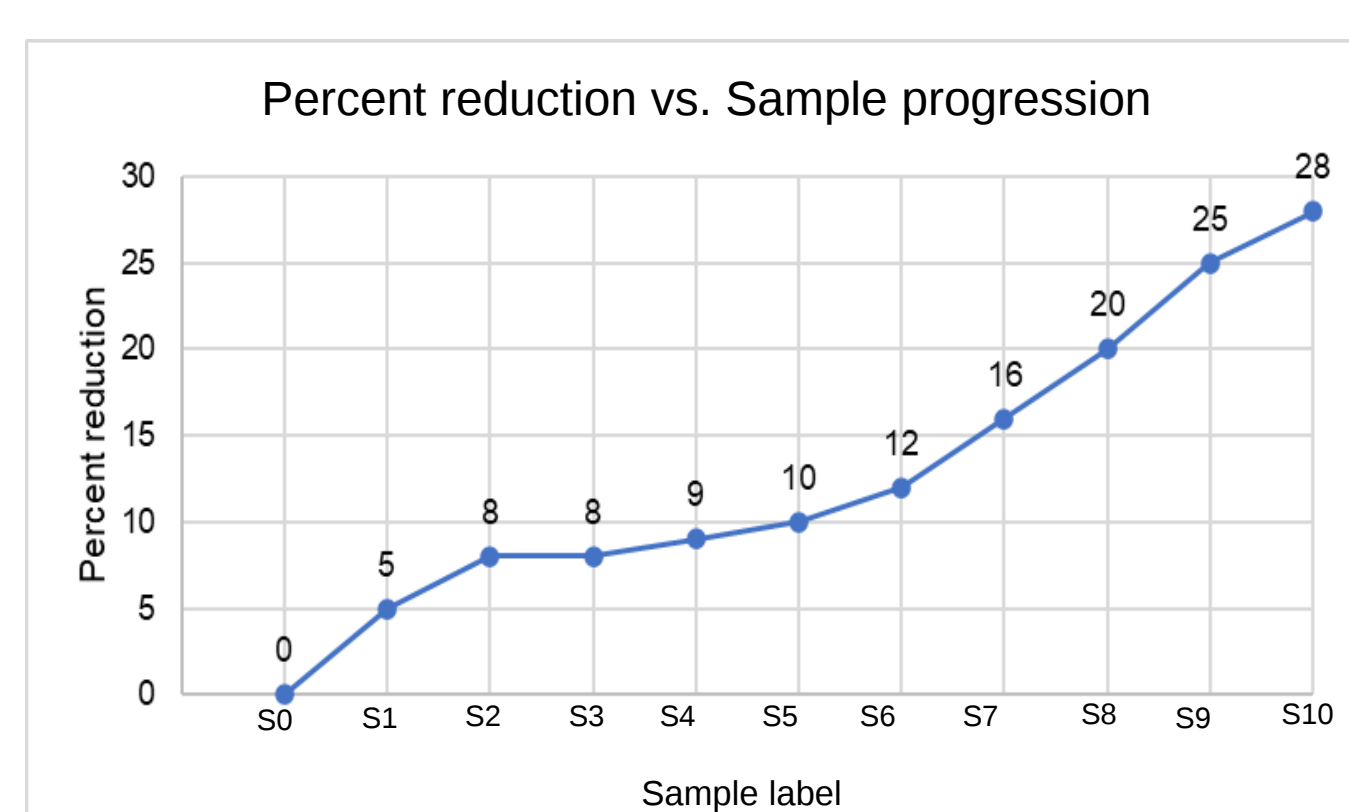


## Experimental details

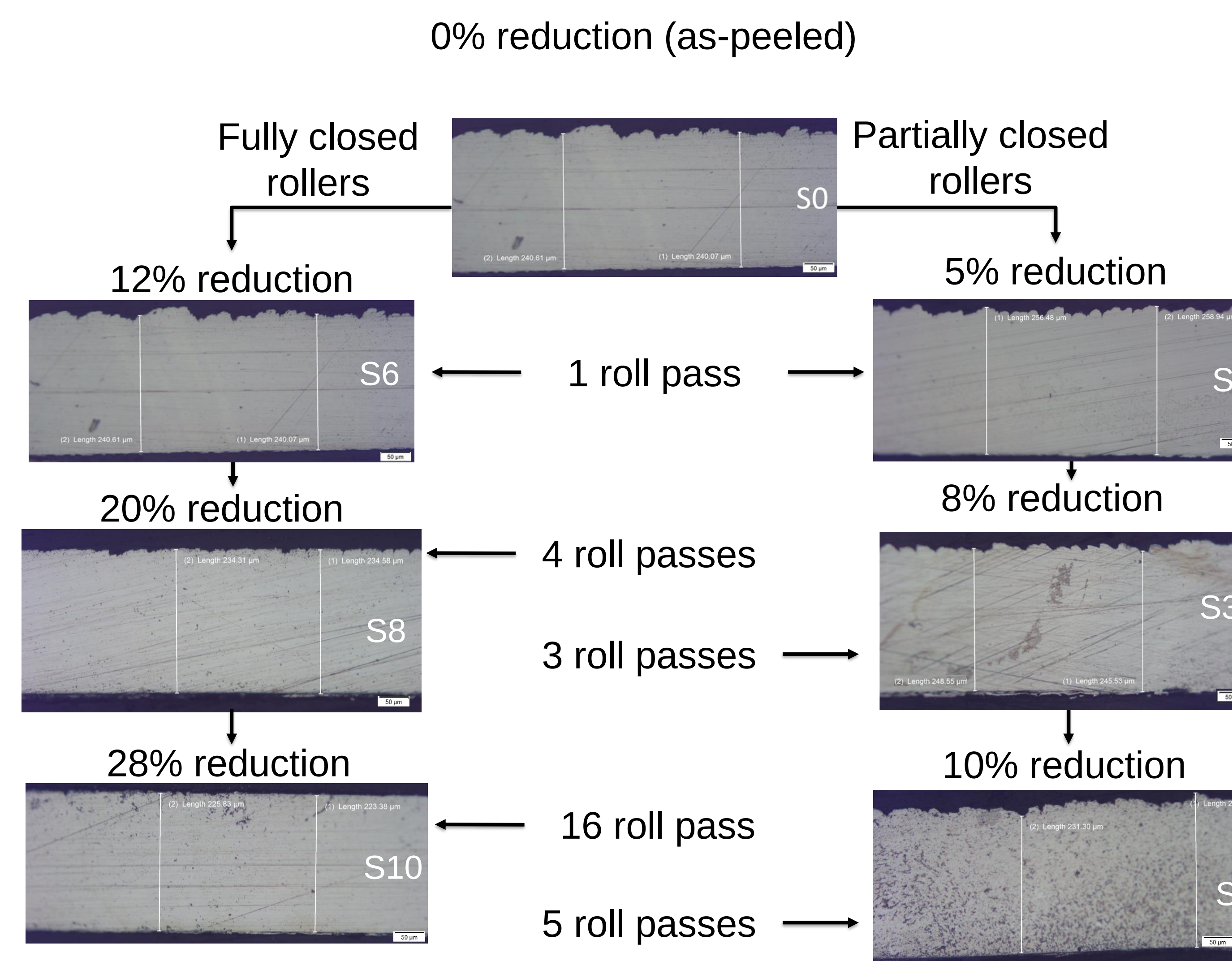
- Stainless steel 304 was used to study the relationship between the % reduction of thickness and surface topography (Ra)
- The overall goal was to optimize the surface finish by varying the rolling parameters
- Two different approaches were considered for reducing the thickness: rollers partially closed (samples S1-S5) and rollers fully closed (samples S6-S10)
- With fully closed rollers, different thickness reductions were achieved by controlling the number of passes

## Strip Characterization

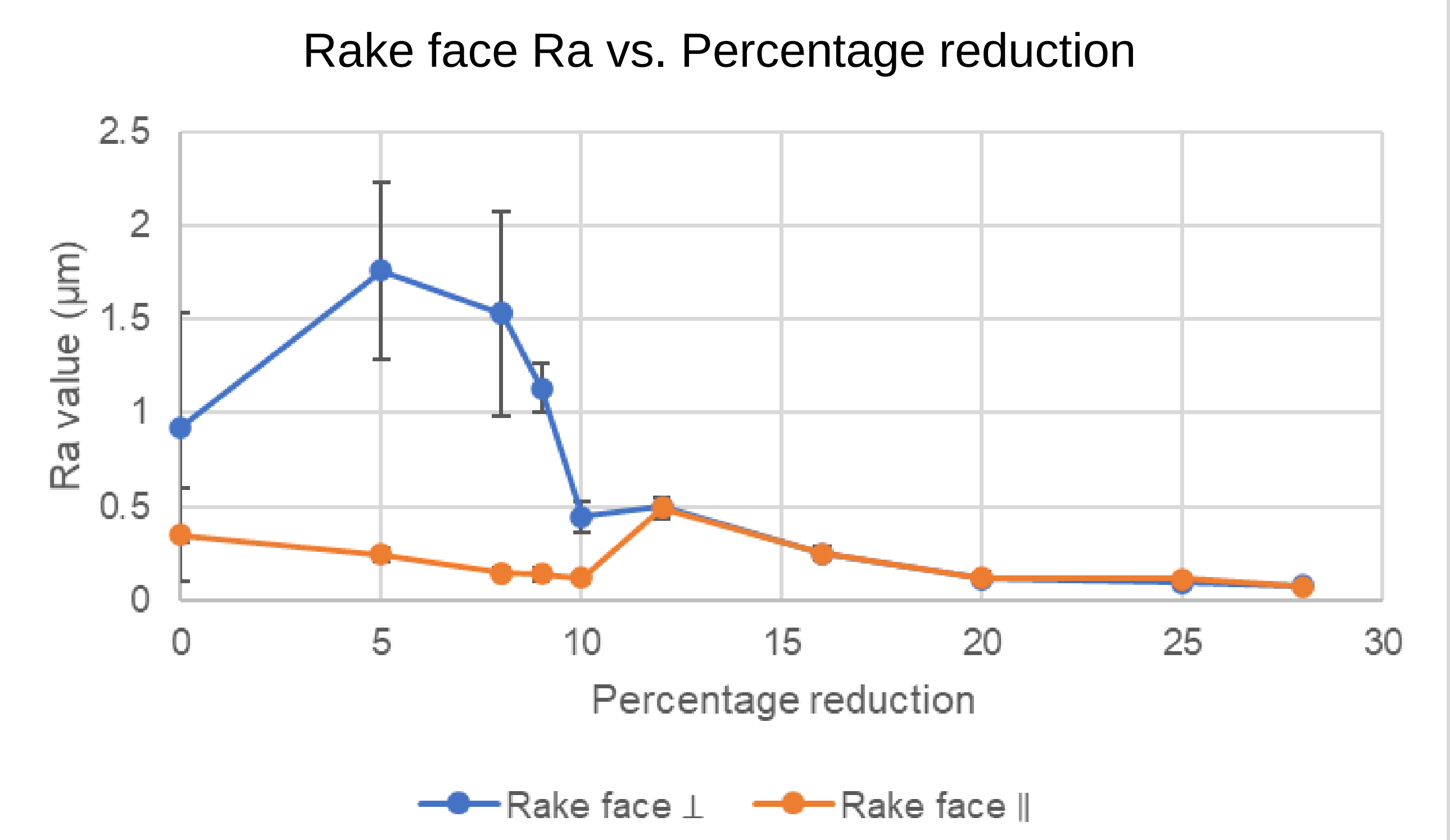
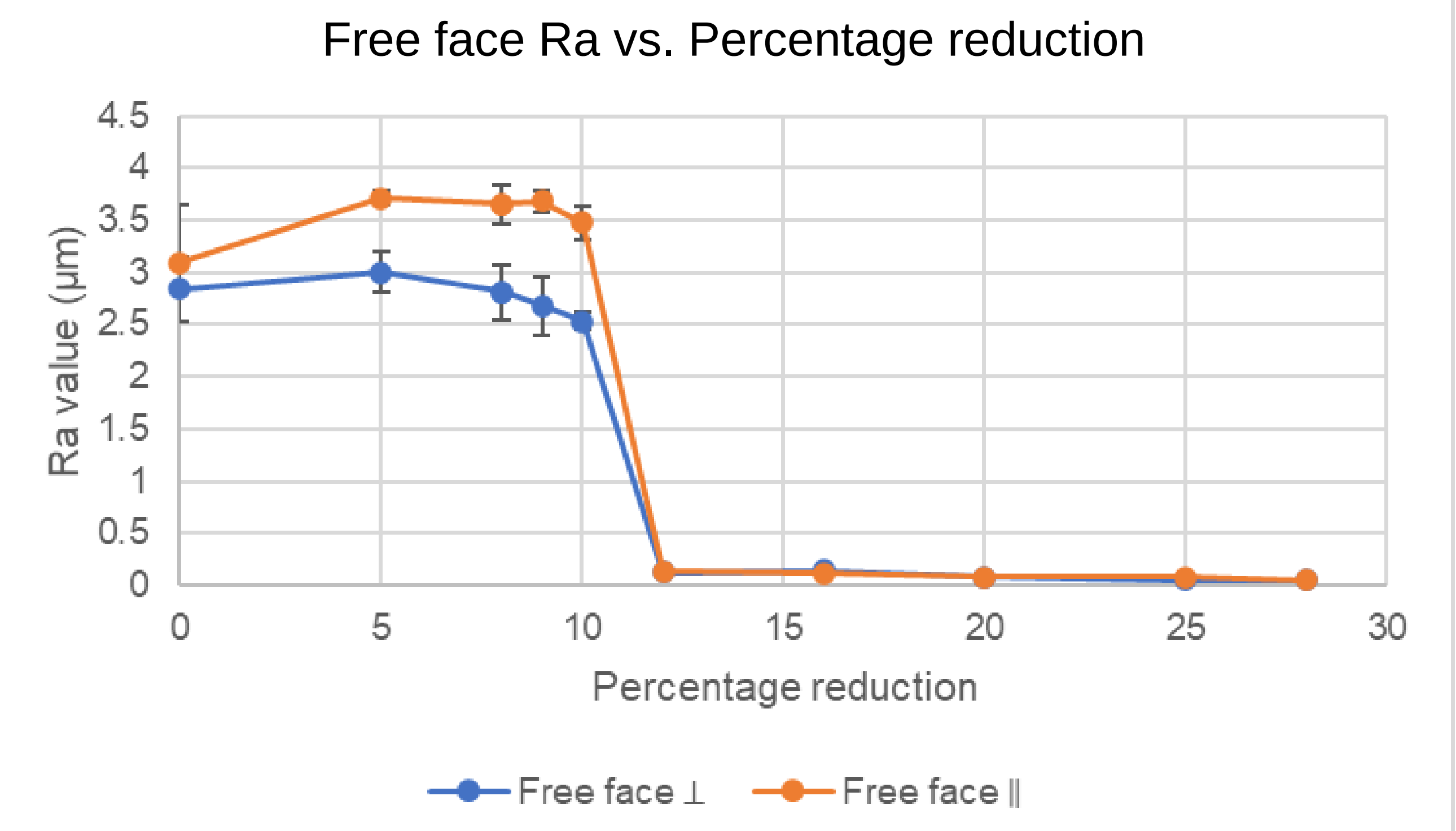
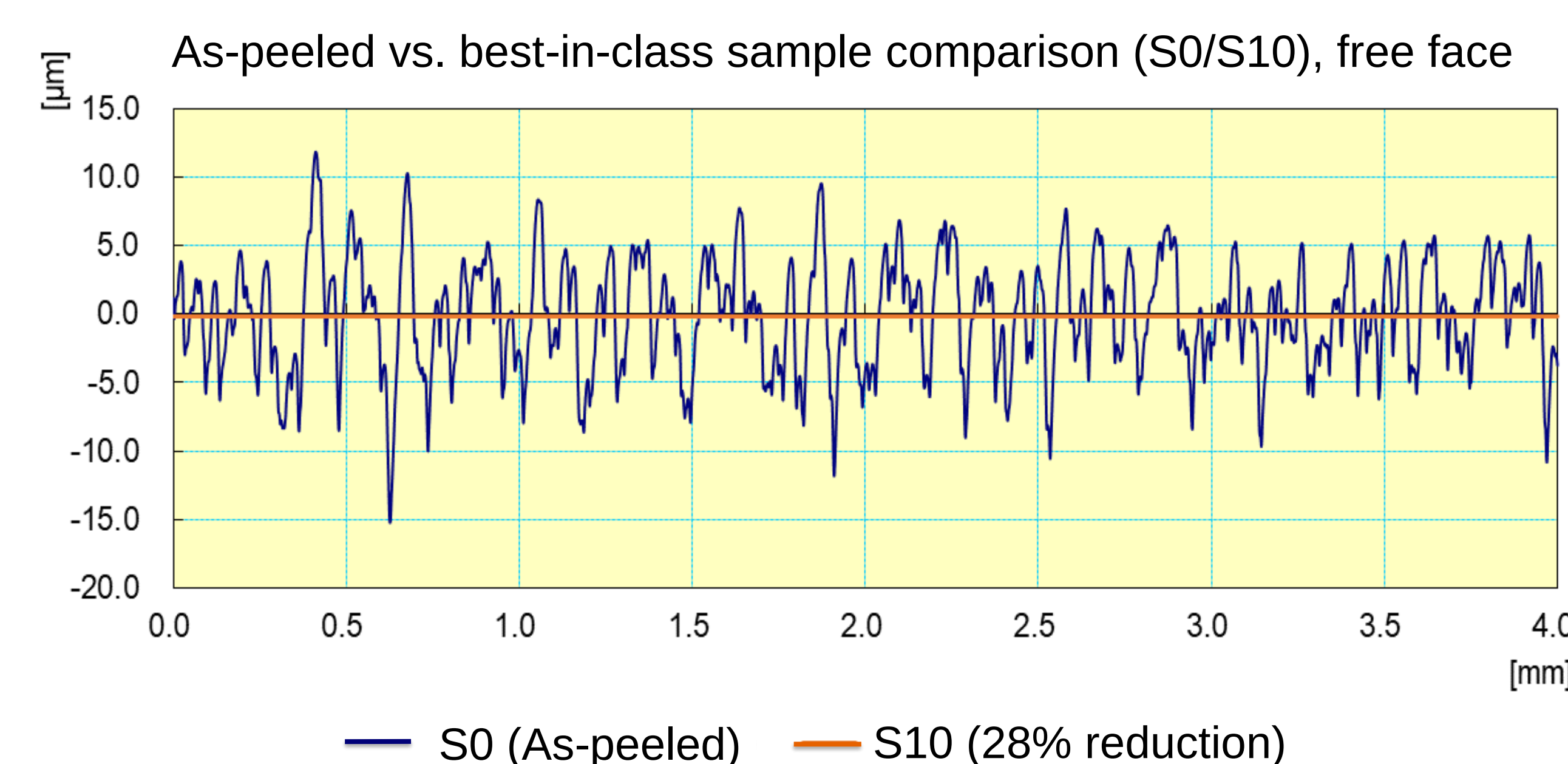
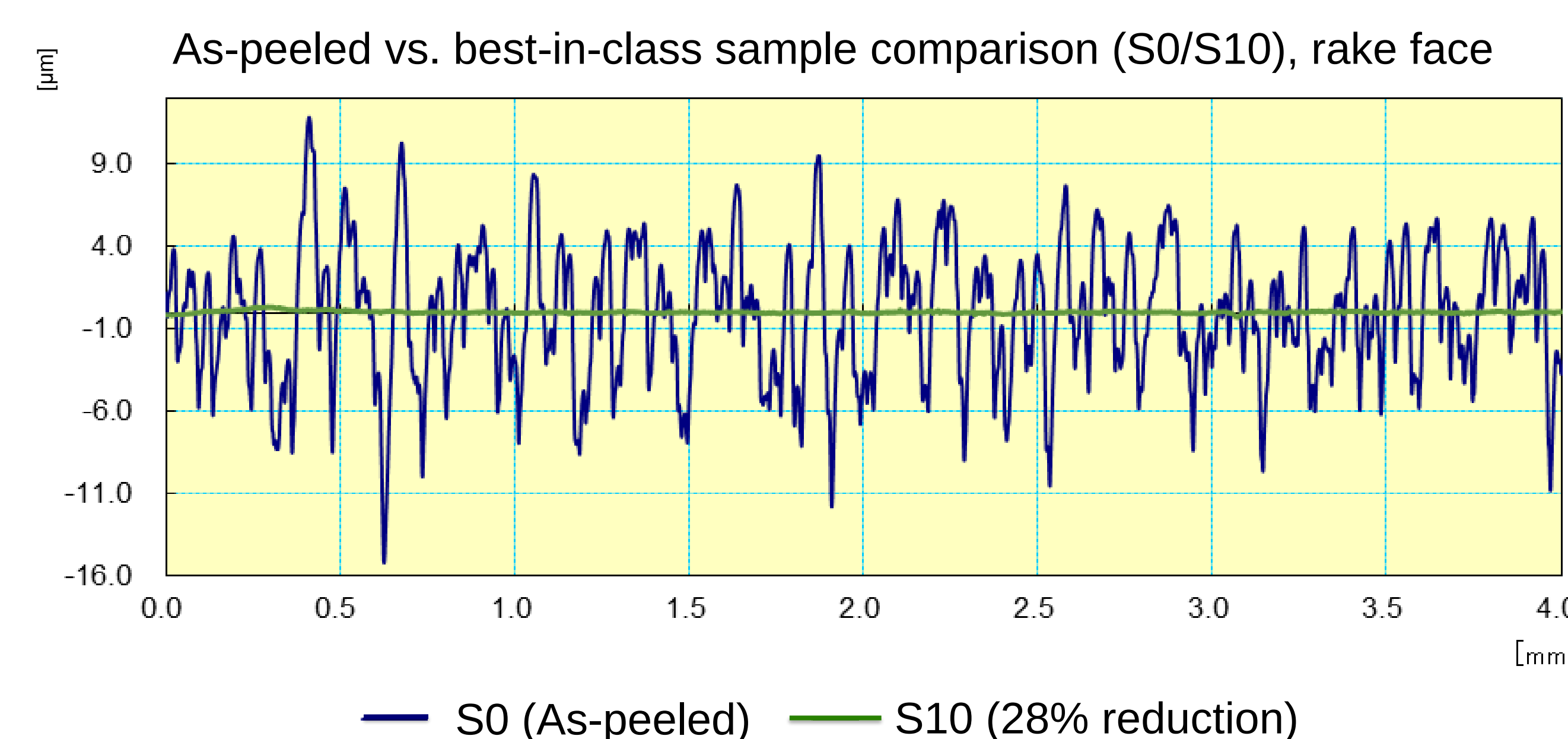
- Strip was characterized in terms of thickness and surface finish
- Thickness measured using two methods: a micrometer and optical microscopy
- Surface finish in terms of Ra was measured using a contact-based profilometer (Mitutoyo Surftest SJ210)
- Ra was measured perpendicular and parallel to the rolling direction and on both the rake face and free face (see figure above)



## Stainless Steel Optical Microscopy



- All images are shown at 20x magnification



## Conclusions

- The free face of the peeled strip has a higher Ra value (rougher), almost three times that of the rake face
- Surface roughness and Ra decrease with increasing reduction in thickness during finish rolling; decrease in Ra beyond 15% reduction is minimal
- Better surface finish is observed when the thickness reduction is achieved in a single rolling pass vs. multiple smaller reduction passes totaling up to the same final thickness reduction
- After finish rolling, the rake and free faces were hardly distinguishable; the different Ra values of these surfaces in the as-peeled strip had little impact on their final finish
- Studies to validate these trends in other steel grades (e.g., mild and low-carbon steels) are ongoing

## Acknowledgements

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