Finnish Institute of Occupational Health

Well-being through work

Desktop 3D Printers: Nanoparticle Emissions

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Background

- 3D-printing are becoming more common
- Different printing techniques exist
- Most popular technique for small scale printing is based on **Material Extrusion (ME)**
  - Thermoplastic polymers as a printing material
    - Acrylonitrile Butadiene Styrene (ABS)
    - Poly-Lactid Acid (PLA)

Background

- Concernes about health and safety issues
- 3D-printers based on ME are shown to strongly emit nanosized particles (Mendes et al. 2016, Kim et al. 2015, Stephens et al. 2013)

Methods

- Measurements in an air tight chamber
  - HEPA-filtered air

Methods

- Instruments
  - Different measuement techniques
    - 1 nm →

Methods

- ABS – Acrylonitrile Butadiene Styrene
- PLA – Poly-Lactic Acid

Summary

- Printing of ABS emitted significant amount on nanoparticles
- Extruder temperature had an effect on the nanoparticle emissions

Summary

- Suitable control measures are recomended
  - Temperature control
  - Maitenance
  - Ventilation
  - Enclosure

More information

- The webpage of the research project http://www.ttl.fi/fi/tutkimus/hankkeet/3d_tulostuksen_kaasu_ja_hiukkaspaastot_eri_tyovaiheissa/sivut/default.aspx
- Poster by Kangas et al.

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Thank you!

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