

Supporting information

Figure S1. Photography images of mille-feuille filters of varying thickness. From left to right: 6, 10, 16, 21, 32, and 67 μm filters.



Figure S2. SEM images of filters of varying thicknesses

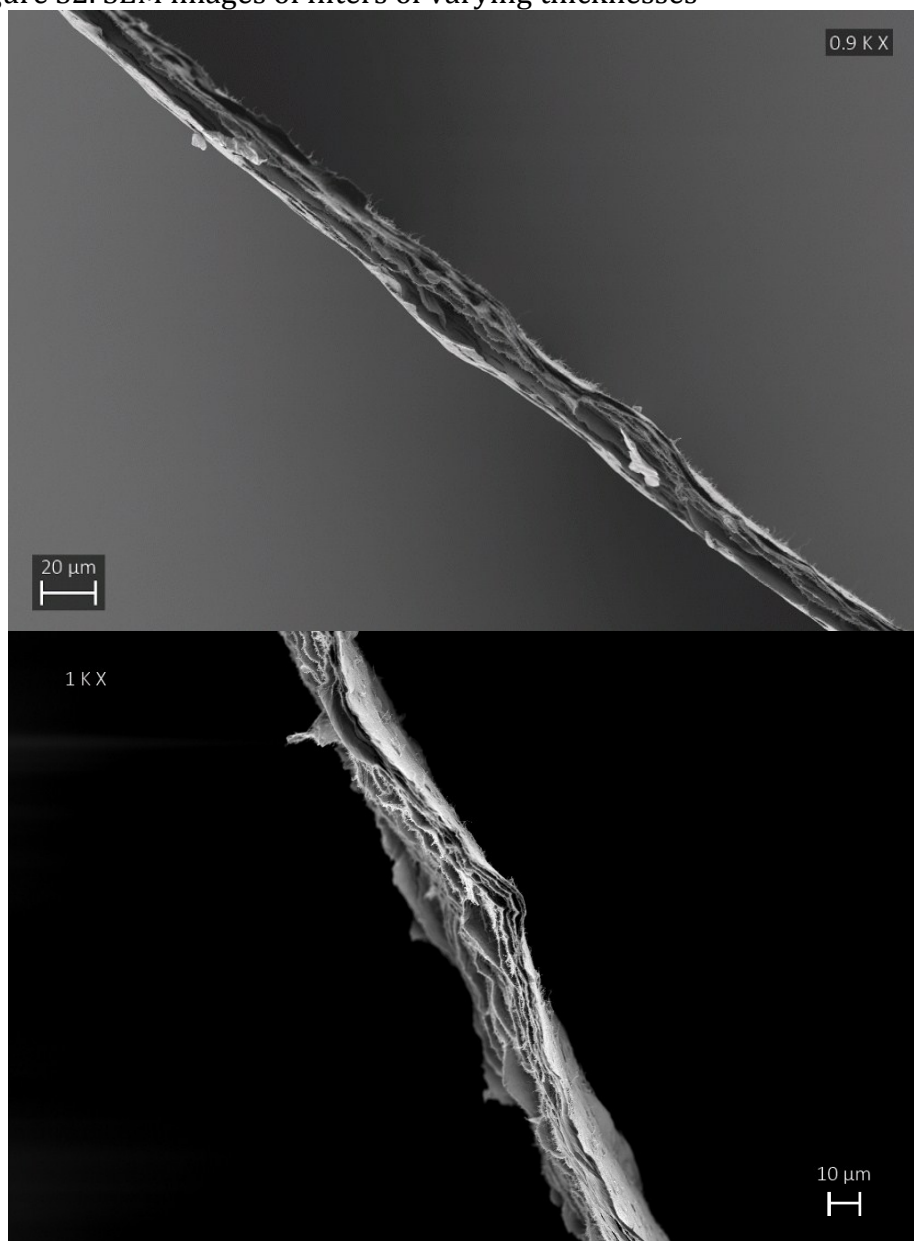


Figure S2 shows the mille-feuille structure of the filters, in which the stacked layers are clearly visible. While the overall thickness of the filter is in micrometer range, its structure is made from cellulose nanofibers which self-assemble in 2D nanosheets, each featuring intrinsic virus removal capacity. While the thickness of the filter has some effect on the removal efficiency, the predominant mechanism of removal is believed to be due to size exclusion as discussed and experimentally demonstrated in the main text. In all, the mechanism of virus removal is complex and requires further in-depth studies.

Figure S3. Relationship between the basis weight and thickness of mille-feuille filter.

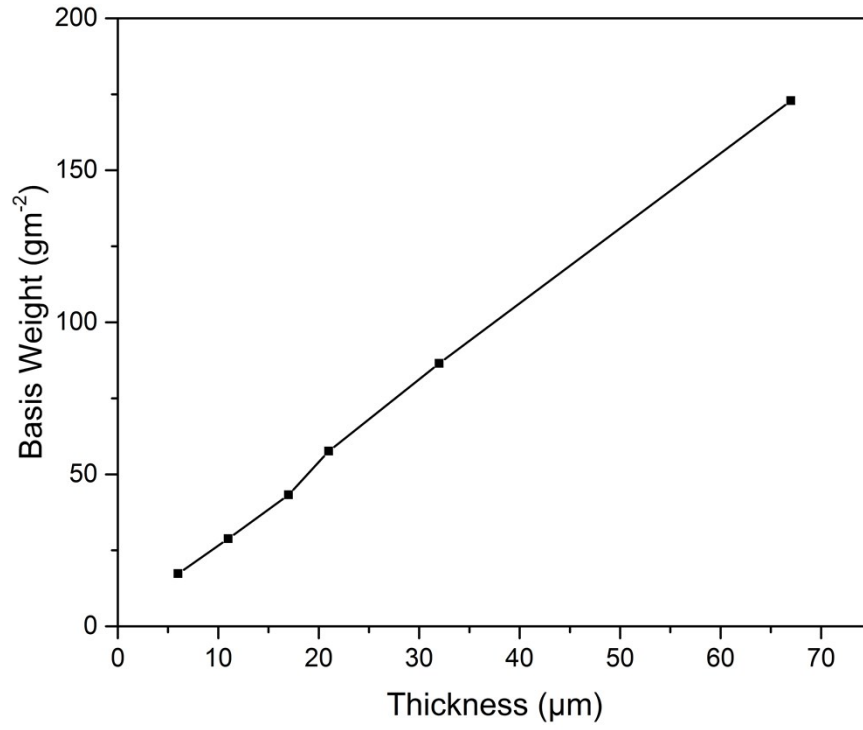
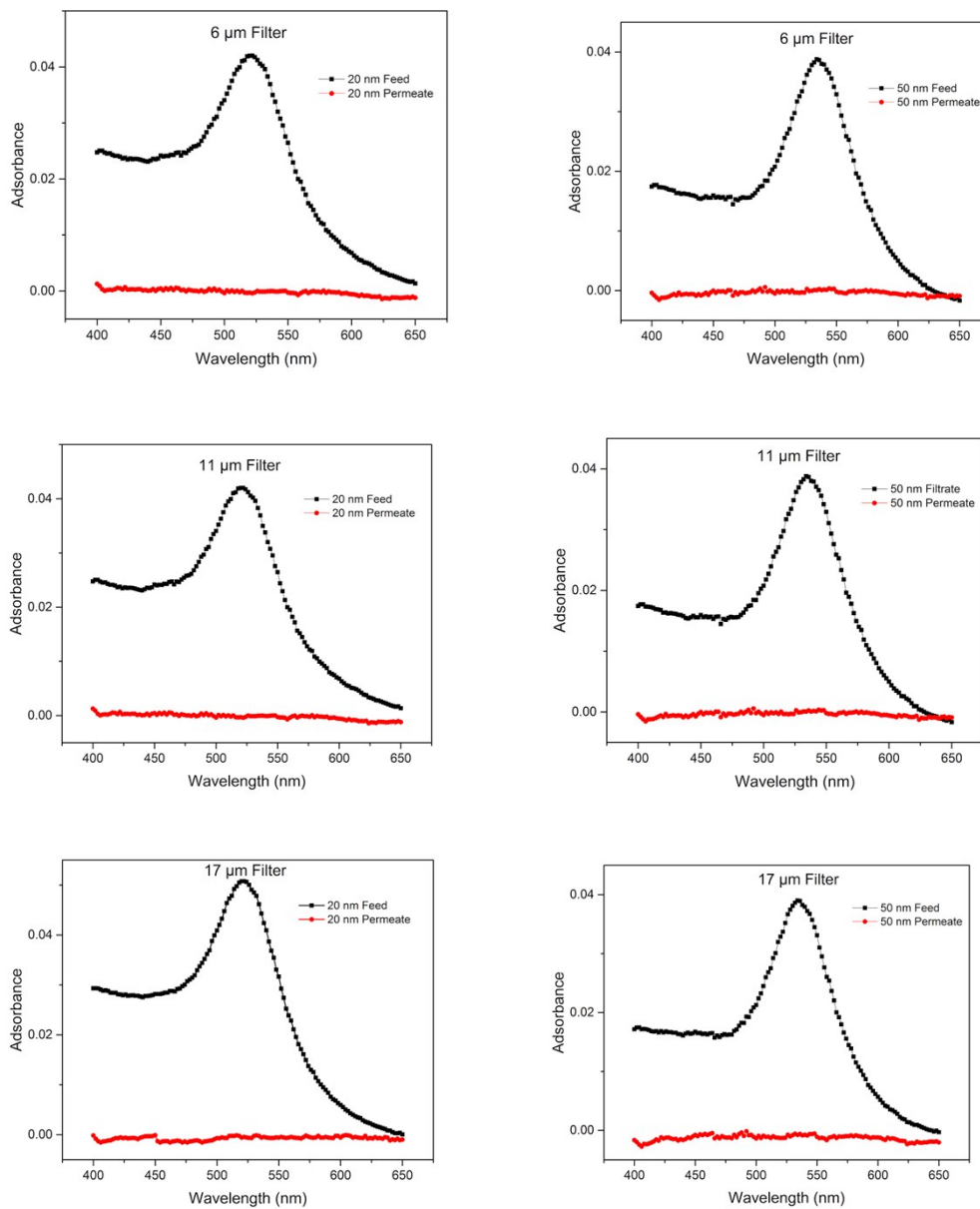
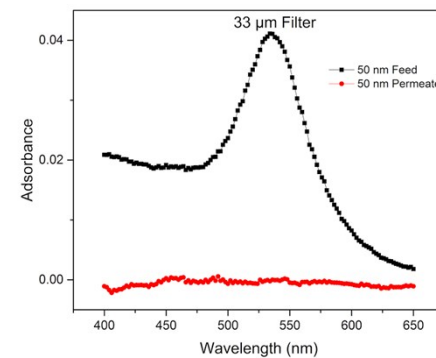
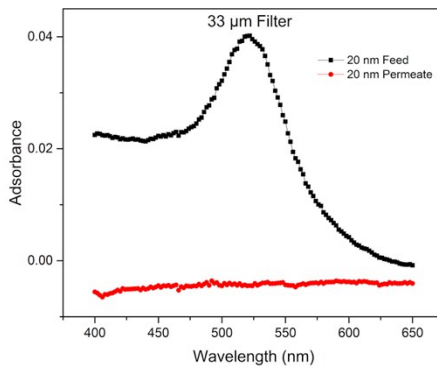
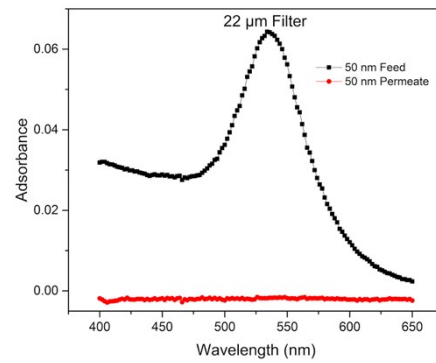
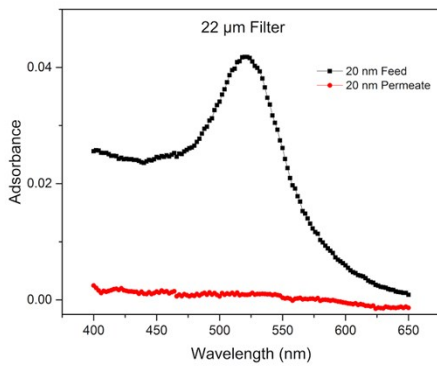


Figure S4. UV-absorbance of surrogate gold nanoparticle solutions before and after filtration through mille-feuille filter.





List of open sources describing state of the art parvovirus removal filters:

Pall DV20

<http://www.pall.com/main/biopharmaceuticals/product.page?id=28637>

Viresolve Pro

<http://www.merckmillipore.com/SE/en/products/biopharmaceutical-manufacturing/downstream-processing/virus-safety/virus-filtration/702b.qB.6KkAAFAU.BkiQpx,nav?bd=1>

Planova 20N

<http://www.ak-bio.com/products/virus-removal/planova-15n-20n-35n/performance/>

Planova BioEx

<http://www.ak-bio.com/products/virus-removal/planova-bioex/performance/>

Sartorius Virosart CPV

https://www.sartorius.com/fileadmin/fm-dam/sartorius_media/Bioprocess-Solutions/Purification_Technologies/Virus_Clearance/Virosart/Data_Sheet/Data_Virosart_CPV_MaxiCaps+Cartridges_SPK2065-e.pdf

Sartorius Virosart HF

http://microsite.sartorius.com/fileadmin/Image_Archive/microsite/polishing_technologies/pdf/Data_Virosart_HF_SPK2139-e.pdf