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In collaboration with

**stream** bio

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## Size of fluorescent polymer nanoparticles

Fluorescent polymer nanoparticles are designed as molecular bioimaging probes with a core-shell structure, manufactured by StreamBio. A light emitting polymer is wrapped around a metal core, then coated with a water-friendly capping agent. These conjugated polymer nanoparticles (CPNs) are reported to be stable for longer than 12 months, nearly 200X brighter than quantum dots, and well over 1000X brighter than conventional dyes [1].

To make sure all the nanoparticles fluoresce in the same way, the size distribution needs to be small. Various techniques exist for measuring the size of nanoparticles, but they only give averages, which miss a lot of important information. Transmission electron microscopy is the perfect tool for the job, allowing us to directly image individual nanoparticles. This gives us a wealth of information about size, shape and uniformity. Using TEM, we can also see the location of the metal core inside them.

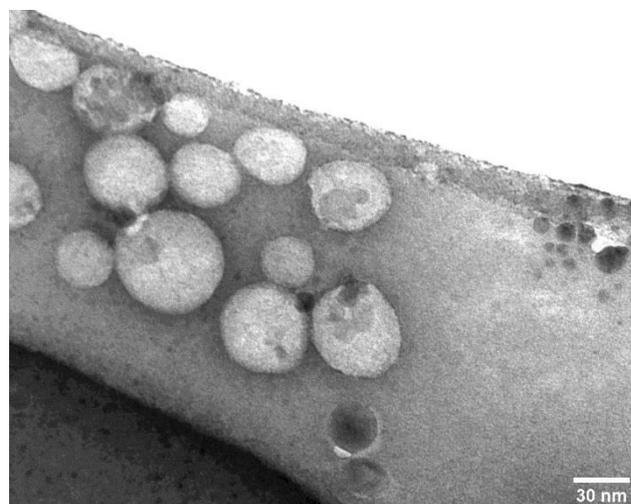
### Techniques and equipment

**Transmission Electron Microscopy (TEM)** provides single nanometer resolution imaging of anything from the internal features of nanoparticles and cells, to the crystal structure of metals.

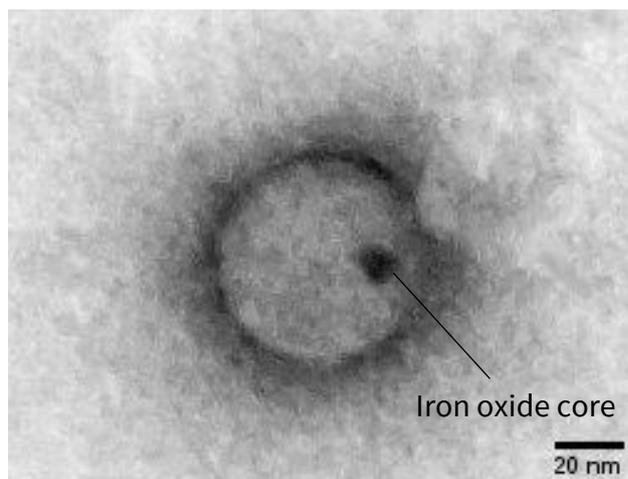
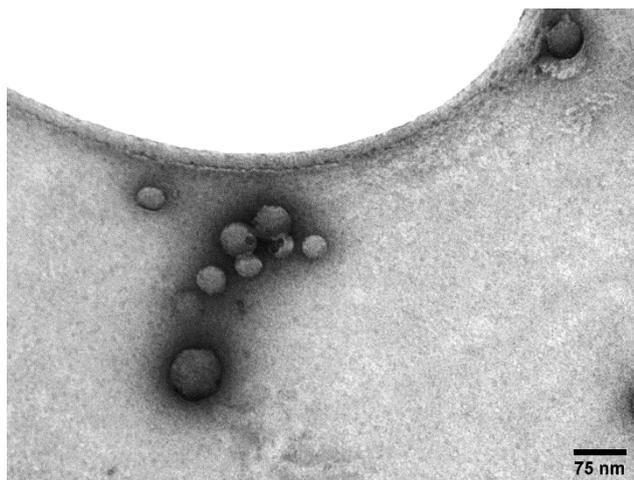
### Process

Negative staining is used to highlight the polymer nanoparticles, which would otherwise have too low contrast to be visible. We also use this technique to image many other organic materials, such as proteins, viruses and hydrogel fibres.

Two samples were analysed, one which fluoresces red, and another which fluoresces green. Multiple images were analysed for each sample to give good statistics.

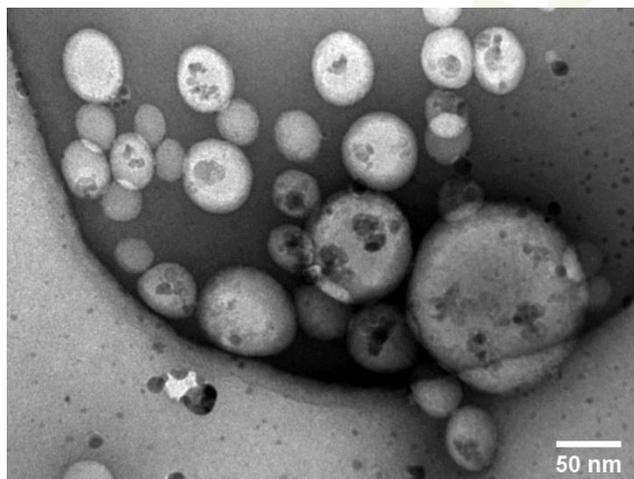


## Results

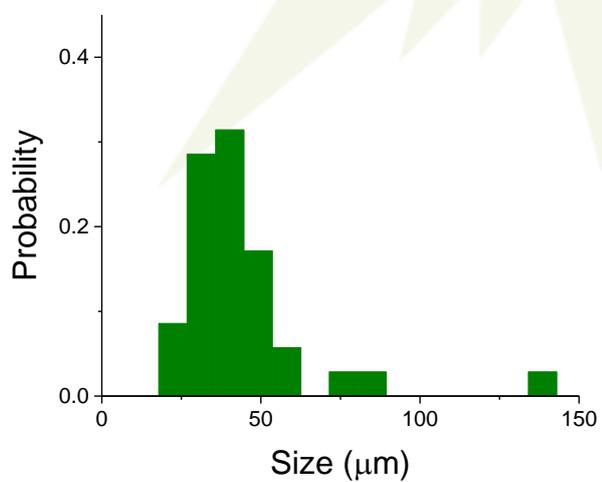


All the nanoparticles appear circular, with the metal core clearly visible inside. As shown below, the green CPNs have a broader distribution in size, hence the larger uncertainty in the average.

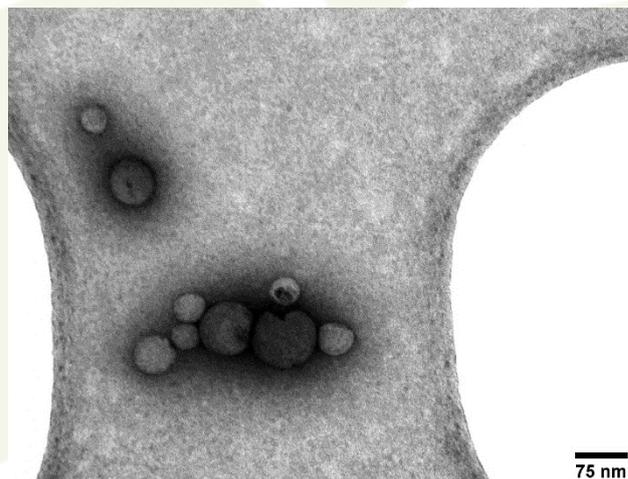
### Green CPNs



Average size:  $43 \pm 4$  nm



### Red CPNs



Average size:  $52 \pm 3$  nm

