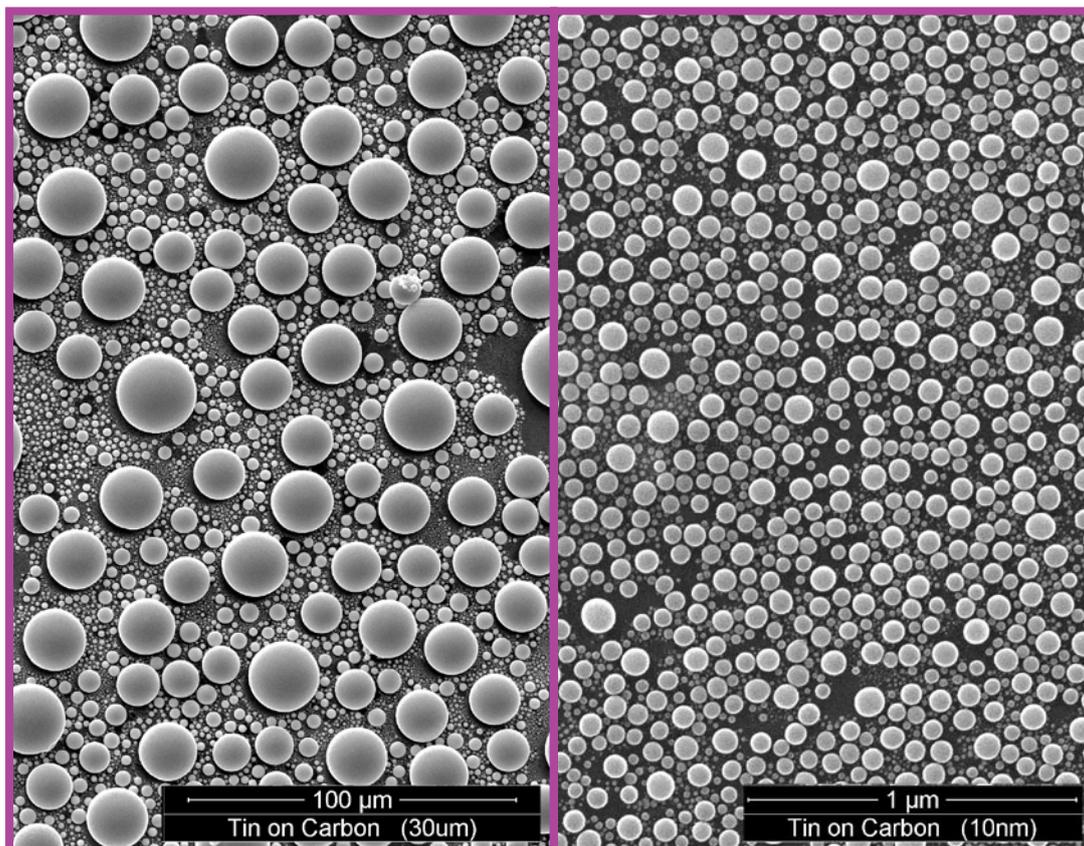


**EM RESOLUTIONS**  
Supporting Electron Microscopy

# Tin on Carbon

## resolution standards

- get the best from your SEM



### **STC5300 Tin on Carbon resolution standard**

Tin spheres with diameters 5nm – 30µm

### **STC1099 Tin on Carbon resolution standard**

Small tin spheres with diameters 10nm – 100nm

**Tin** on Carbon resolution standards are an industry standard for resolution, astigmatism and image shift measurements for SEMs. The relatively high atomic number of tin gives the spheres high contrast against the carbon substrate.

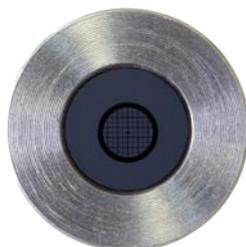
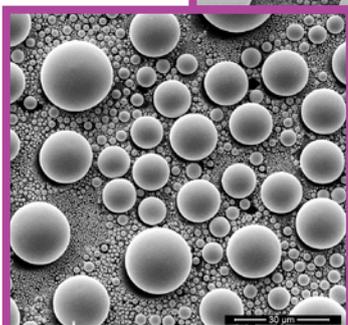
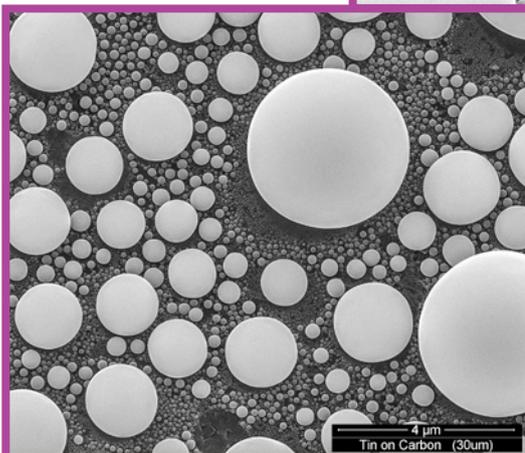
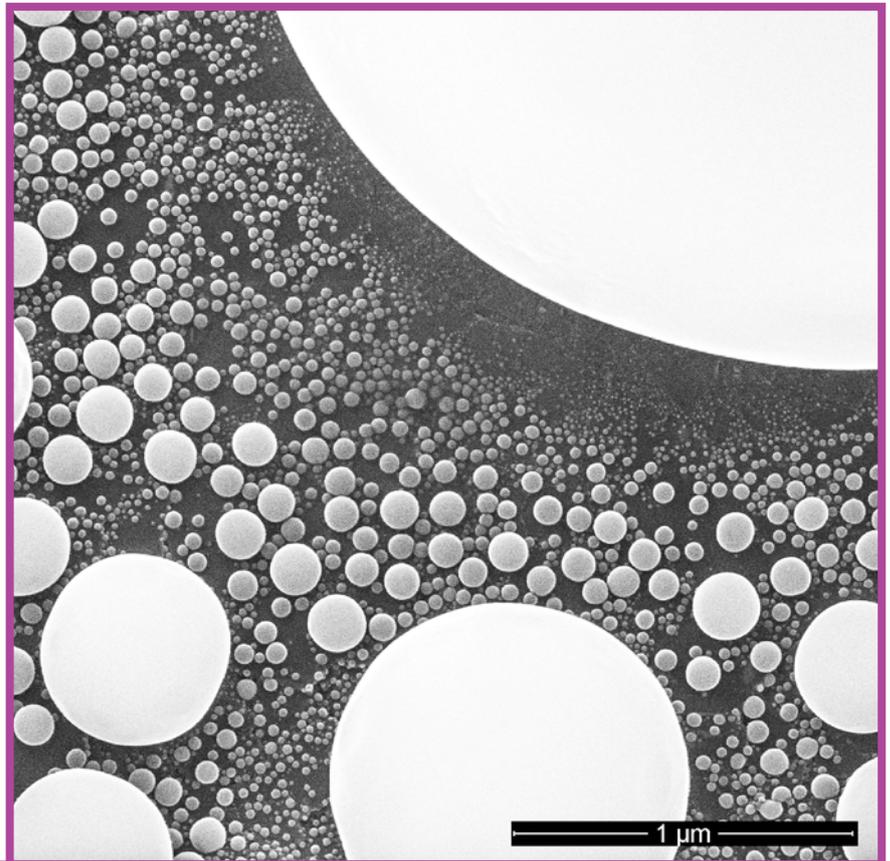
Tin on Carbon standards are available from EM Resolutions Ltd in two sphere size ranges;

**STC5300** has sphere sizes that can be imaged over a wide range of magnifications, accelerating voltages and spot sizes, using a single calibration specimen. This is a particularly good resolution test specimen for training new users of SEMs.

The ability to image the specimen at low magnification simplifies initial focussing at low accelerating voltages.

**STC1099** has smaller sphere sizes and is particularly suitable for modern hi-resolution FEGSEMs.

increasing magnification



### Re-ordering details:

**STC5300** Tin on carbon and **STC1099** small tin on carbon are usually supplied on 12.5mm pin stubs.

The higher resolution standard has a grid pattern to facilitate locating and positioning.

If you require an unmounted resolution standard please add a U after the part number when ordering e.g. **STC5300U**.

For resolution standards on other stubs please specify on your order.

# Instructions for use

## 1. Resolution testing

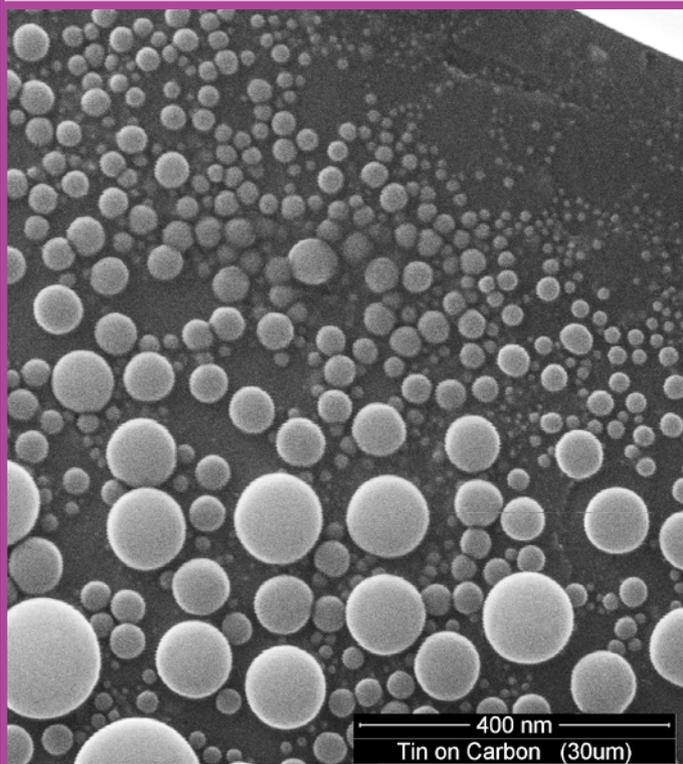
The spaces between adjacent Tin spheres are the smallest features that can be used for measurement of instrument resolution [see images below]. The smallest gap between two spheres that can be resolved, is a measure of the resolution of the SEM at the accelerating voltage and working distance being used.

**Please note: The smallest spheres and the gaps between them will be found in the shadow of the largest spheres.**

If operating at low accelerating voltages the smallest gaps may not be resolved [see bottom right] and areas with larger spheres should be selected. Some mechanical rotation and tilting of the specimen may be necessary to ensure that the chosen areas are facing the SE detector.

If the specimen is tilted towards the detector, only measurements made in the horizontal direction will be valid. The true magnification at which measurements are made should be verified by first calibrating the magnification under the conditions being used, with a suitable magnification reference standard.

The definition of the spheres and the gaps between them diminishes with lower resolution.



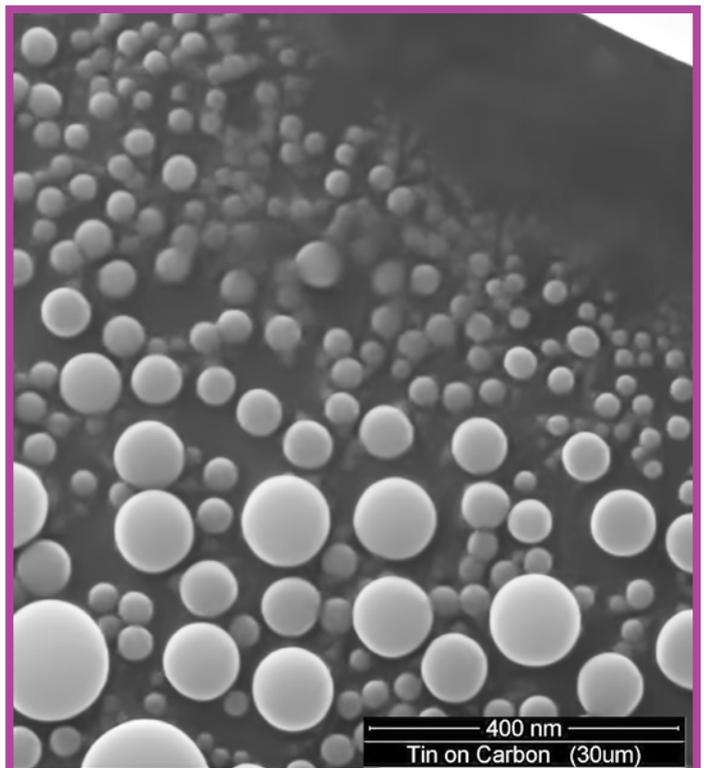
## 2. Astigmatism Correction

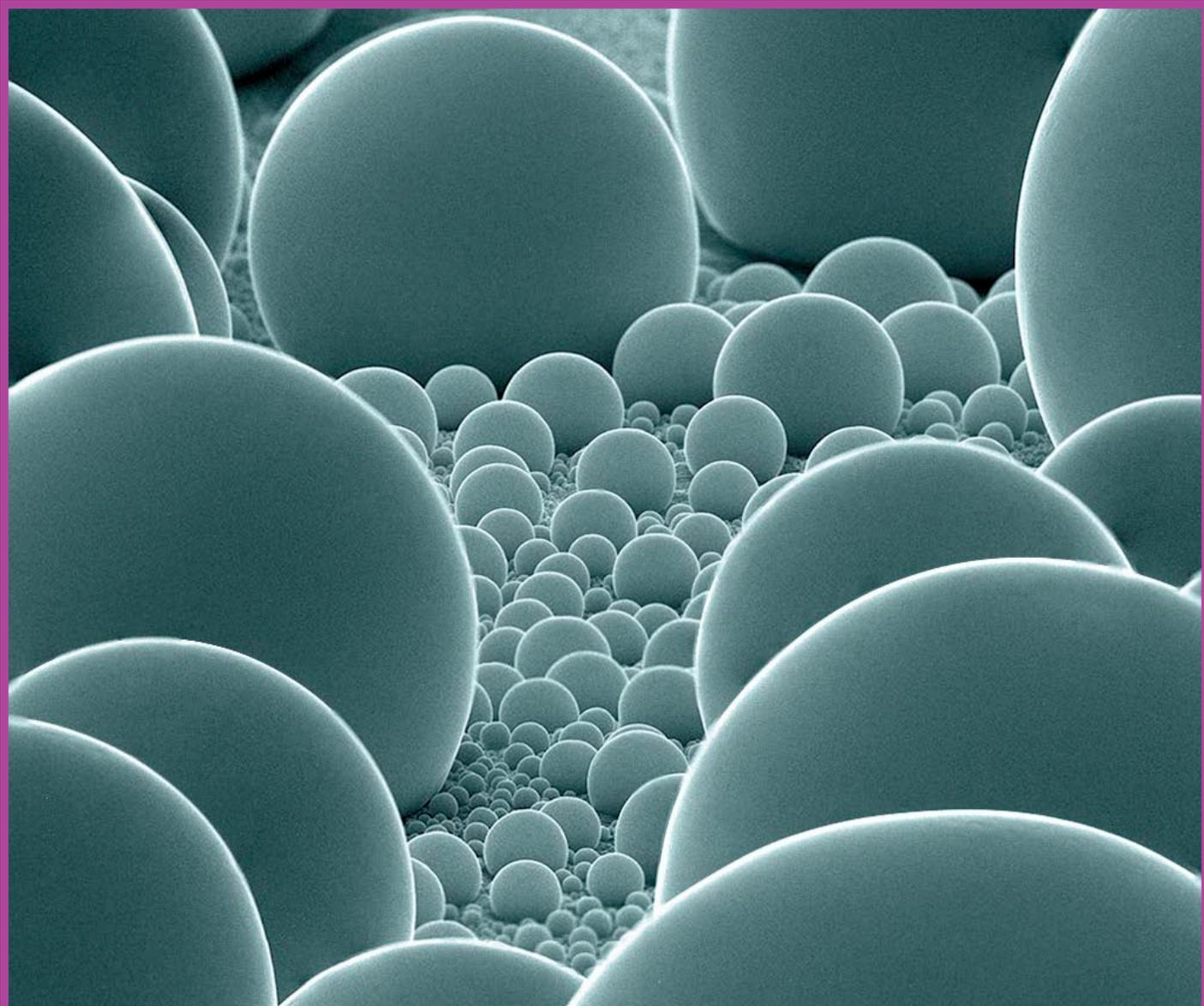
The manufacturing process produces near perfect Tin spheres, which are not damaged by the electron beam. If any astigmatism is present it will result in the spheres appearing distorted. Due to their round shape it is relatively easy to see distortion and apply the appropriate stigmator correction.

Tin on Carbon test specimens should be used as a periodic check on the state of the electron column by assessing the amount of correction required to eliminate astigmatism. If astigmatism is present on the users specimen and cannot be corrected, the tin on carbon test specimen should be used to confirm whether astigmatism is inherent in the column or caused by the specimen itself.

## 3. Image Shift

If the electron column has been dismantled or apertures exchanged, some re-alignment may be necessary. The largest tin spheres can be used at relatively low magnification to observe image shift with changes in accelerating voltage or spot size. As the alignment is improved, the magnification can be increased and smaller spheres selected for fine adjustment of alignment.





Tilted SEM view of tin spheres on carbon  
Image courtesy of Dave McCarthy, UCL School of Pharmacy



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**EM** Resolutions Ltd was founded in 2012 and has been supplying high quality TEM support films and calibration standards to EM laboratories and consumables companies throughout the UK and the rest of Europe. Our technical staff have over 50 years combined experience, learned under the expert guidance of Alan Agar, one of the pioneers of consumables and accessories for electron microscopy.

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