Improving cutting tools with insights from neutron tomography

Hjalmar Staf, Sandvik AB, Sweden

Swedish company SANDVIK Coromant supplies cutting tools and solutions to the metal cutting industry. Inserts for cutting tools are manufactured by compacting hard metal powder, followed by sintering and post treatment. During the compaction process, friction between the powder and the press tool gives rise to density gradients in the powder compact. This gradient leads to uneven shrinkage during sintering, making it difficult to predict the final shape.

By performing finite element simulations of the compaction and sintering process, the shape after sintering can be predicted. So far, it has been difficult to experimentally verify the simulated density gradient after compaction and here neutron measurements are very helpful.

Measurement of the density gradient after compaction requires radiography or tomography techniques, meaning that the beam must be able to pass through the entire thickness of the sample. This presents a challenge, since the compacted components produced by SANDVIK Coromant often contain more than 80% tungsten carbide, a material that is known to have high X-ray absorption. However, this issue is considerably reduced by using a neutron beam.