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P4.214 Transmission Kikuchi diffraction on carbon extraction replicas: a novel high statistics precipitate characterization pathway for Eurofer-97 steel.

Thursday, 20 September 2018 11:00 (2 hours)

Innovation in materials technology goes in parallel with advancements in material characterization techniques. Recent years have seen a large increase in use of transmission Kikuchi diffraction (tKD) to solving complex materials science problems, including nuclear materials and irradiation damage. A lack of high statistics in transmission electron microscopy (TEM) characterization of precipitates in steels has long been a challenge. We have developed an innovative method of combining tkD analysis and carbon extraction replicas, using which thousands of precipitates can be characterized and their phases identified in one single scan. This method was applied to study a Eurofer-97 steel in non-standard metallurgical heat. We show that tKD on replicas is highly suitable to identify precipitates in Eurofer-97 steel and very small precipitates, down to ~5-10 nm, can be easily identified. Scanning TEM X-ray mapping of the same regions of the replica were also performed, which allowed conclusions on the chemical composition of the different types of precipitates identified by tKD to be drawn, with unprecedented statistics. This technique opens new pathways to characterizing irradiated and non-irradiated materials for fusion reactor applications and beyond.

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