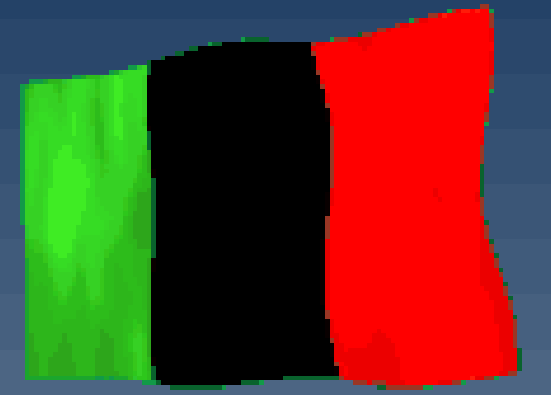


Analysis of the causes of breaks of Cu wires during the industrial wire drawing process

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INTRODUCTION

The process of drawing copper wires is the most commonly used copper processing. This is due to the fact that approximately 75% of the world's annual copper production is used in electrical engineering in the form of cables and conductors, the basic component of which are Cu wires. Hence, mass production of Cu wires must guarantee the highest efficiency and the highest quality of wires.

The process of drawing wires from among all cold metal forming processes gives the lowest deformability. It is due to among other things, by the stress state in the plastic deformation zone, where tensile stresses are the dominant component. Moreover, in this case the drawing force is applied to the final wire - which additionally contributes to the danger of wire breakage during drawing process. Cu wire breaks have their origin in the quality of the input material also. For example chemical composition, porosity, surface quality, grain size.

The article presents identification of various copper wires defects and assesses the influence of various cold drawing process parameters (number of drafts, drawing speed, dies and lubricants quality) and of the quality of the copper raw material (impurities and oxygen content, material discontinuities, grain size etc.) on the generation of wire failures. Research results are preceded by theoretical analysis of mechanisms of wires breakage formation during the drawing process on the basis of world literature.

RESEARCH RESULTS



Fig.1. SEM image of Cu-ETP wires fracture and EBSD analysis, mag. x 500

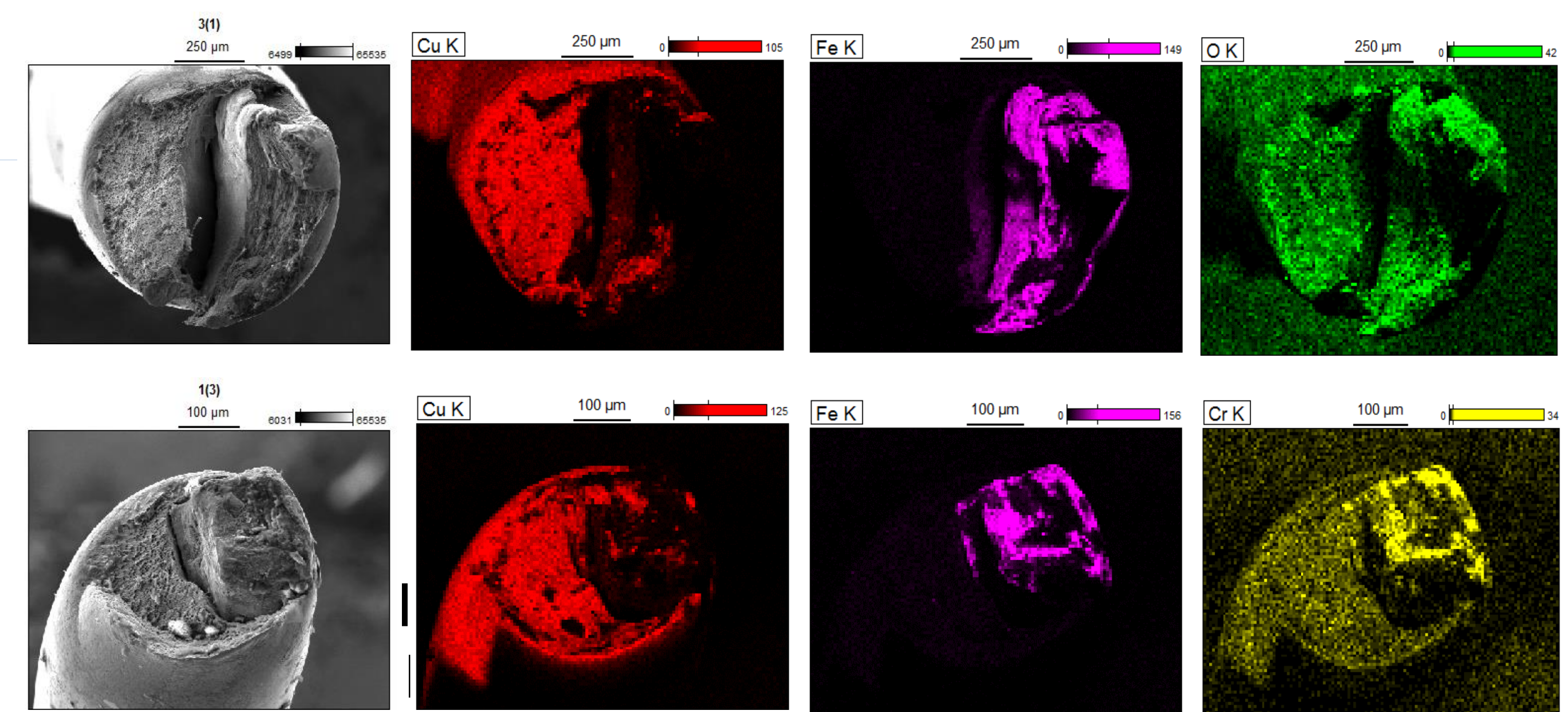


Fig.2. SEM image of Cu-ETP wires fracture and EBSD analysis, mag. x 500

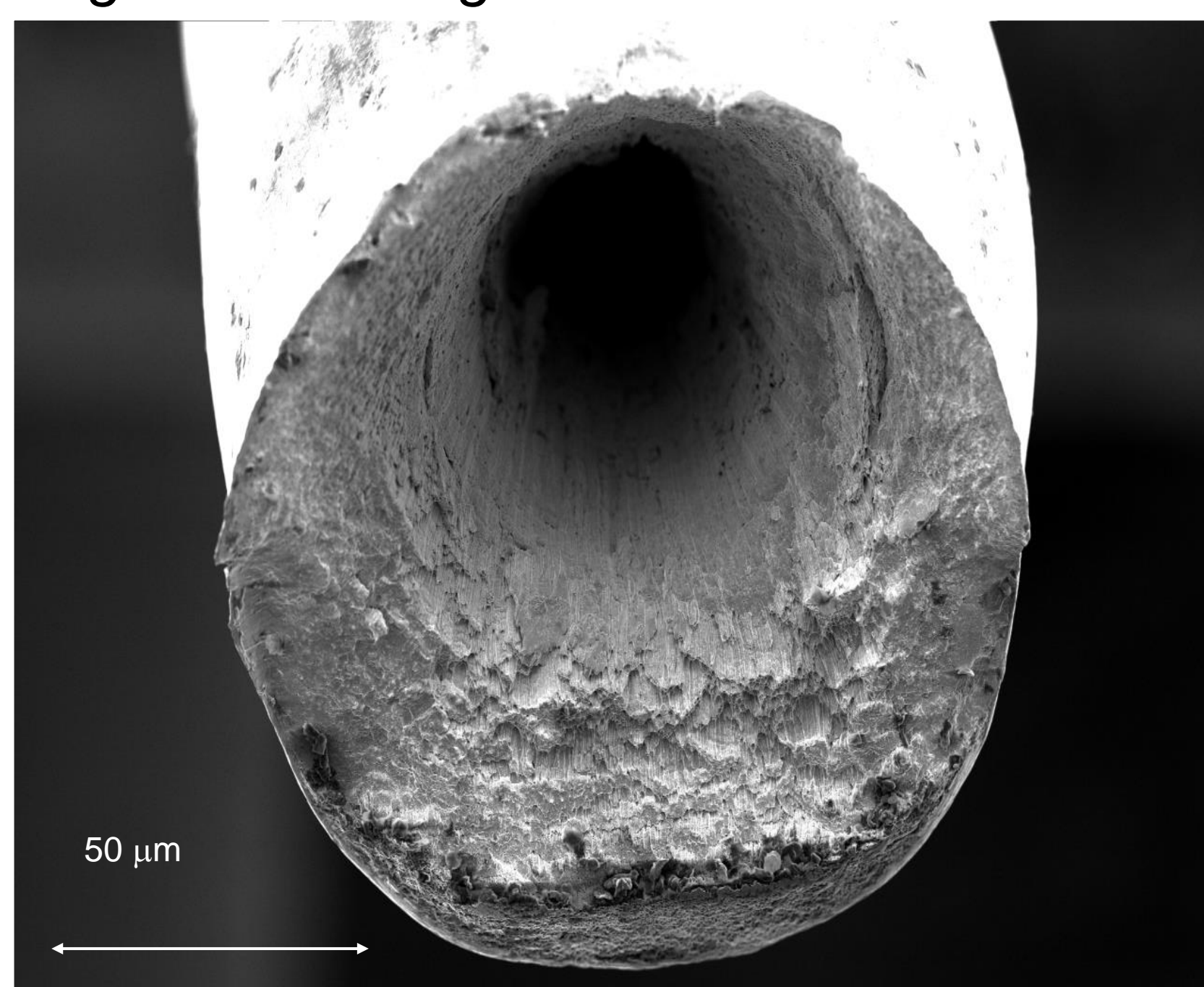


Fig.2. SEM images of Cu wires fracture, mag. x 50 (inclusions and hollows)

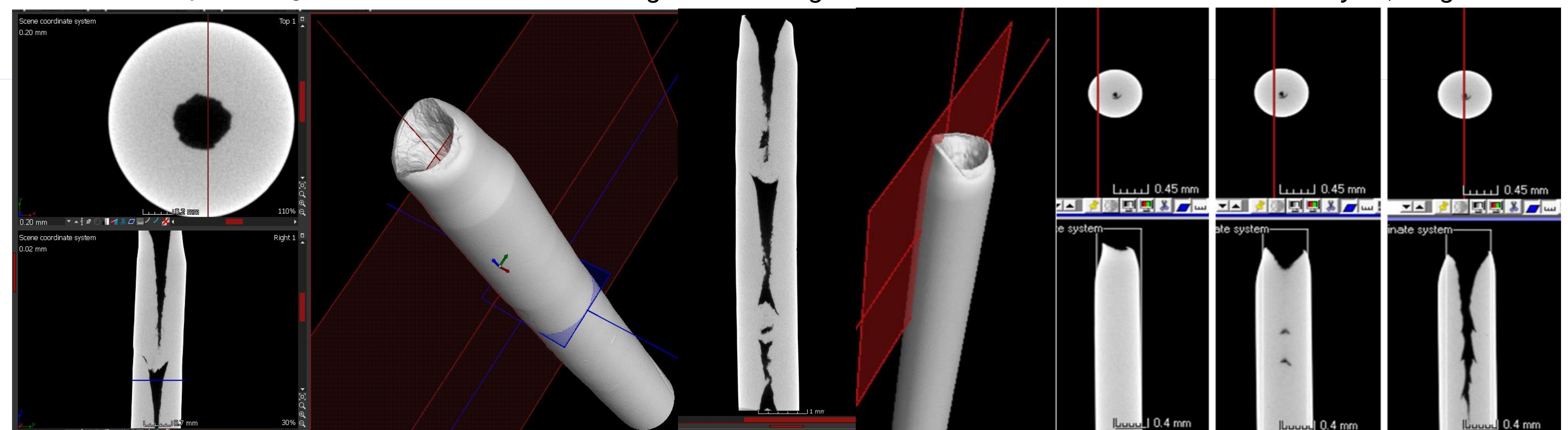


Fig.5. 3D computer tomography images of copper wires breakages (types: holloes)

