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Sommario/riassunto	This thesis addresses selected unsolved problems in the chemical mechanical polishing process (CMP) for integrated circuits using ruthenium (Ru) as a novel barrier layer material. Pursuing a systematic approach to resolve the remaining critical issues in the CMP, it first investigates the tribocorrosion properties and the material removal mechanisms of copper (Cu) and Ru in KIO4-based slurry. The thesis subsequently studies Cu/Ru galvanic corrosion from a new micro and in-situ perspective, and on this basis, seeks ways to mitigate corrosion using different slurry additives. The findings presented here constitute a significant advance in fundamental and technical investigations into the CMP, while also laying the groundwork for future research.