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Pad Surface Characteristics and their Effect on Within Wafer Non-Uniformity in Chemical Mechanical Polishing

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Abstract : Uniformity related issues in chemical mechanical polishing (CMP) are within wafer non-uniformity (WIWNU), wafer to wafer non-uniformity (WTWNU), planarity and dishing/erosion. Here, the WIWNU that originates from spatial distribution of independent variables such as temperature, sliding distance, down force and material removal rate (MRR) during CMP, relies to spatial dependency. Among various sources of spatial irregularity, hardness and modulus of pad and surface roughness in sources for pad uniformity are great, especially. So, we investigated the spatial variation of pad surface characteristics using pad measuring system (PMS) and roughness measuring system. Reduced peak height (R_{pk}) of roughness parameter shows a strong correlation with the removal rate, and the distribution of relative sliding distance onwafer during polishing has an effect on the variation of R_{pk} and WIWNU. Also, the results of pad wear profile thorough developed pad profiler well coincides with the kinematical simulation of conditioning, and it can contribute for the enhancement of WIWNU in CMP process.