

Direct Measurement of Potential Difference between Two Surfaces in a Process of Contact and Separation

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Abstract— We report here a novel development of a new apparatus to measure surface potential difference between an insulator film and a metal plate in a process of their contact and separation, in order to confirm charge relaxation due to gas discharge. The apparatus allows us to control the contact gaps precisely and to measure the surface potential of a charged film against a metal plate. In an actual experiment, the change of the potential difference and the gap were recorded with teflon film and well-polished stainless steel. Sharp potential drops in the separation process were obtained although there was no such change in the approaching process. Therefore these potential drops were assigned to charge relaxations due to gas discharge during the separation. Although the potential drops looked happening randomly in each experimental run, but after an accumulation of these data, the relationship between the starting potential of the drop and the corresponding separation gap showed a universal curve. Interestingly the curve is fairly lower than Paschen's curve, and it rather showed linear relationship corresponding electric field strength as 5 MV/m. We also studied the effect of separating speed on the phenomena. The relationship between the starting potential and gap did not depend on the speed strongly, whilst the interval of the dropping events did.