

Transient Mode Processing Technique : Theory and Applications

Alexander Shapurko,¹ Richard Soltis² and Ken Nietering²

¹Institute of Mechanical Engineering Problems
61,Bolshoy pr.V.O.
St-Petersburg 199178
Russia

²Ford Motor Company
MD3028/SRL
Dearborn, MI 48121-2053
USA

³Ford Motor Company
MD3028/SRL
Dearborn, MI 48121-2053
USA

Transient Mode Processing Technique (TMPT) has been developed for identification of limiting factors of mass transport chain in electrochemical devices.

Based on an idea that under transient conditions the slowest stage has to become a “bottleneck” for general mass transport process in particular electrochemical device, we obtained the solution in form of approximation for a certain function related to that mass transport process, which clearly reflects relationship between the function and rate-limiting stage parameters under transient condition via relaxation time of the device . This approach allows obtaining basic information for devices optimization (by tuning of each stage parameters in mass transport chain within range when relaxation time of the stage remain lower than that of critical stage via changes of geometric factors related to the particular stage) , improvement (by changing of critical stage or tuning of critical stage parameters) and control(by monitoring changes of critical stage parameters).

Detailed applications of this technique will be shown on examples of commercially available electrochemical devices.