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Macroscopic visualization for statistics and microscopic identification of species roles in web-like plasma-enhanced chemical networks OSAMU SAKAI, YASUTAKA MIZUI, TETSUYA KOJIMA, MASATAKA KOSHIBA, The University of Shiga Prefecture, AKINORI IWAI, Kyoto University, SHIGEYUKI MIYAGI, The University of Shiga Prefecture, TOMOYUKI MURAKAMI, Seikei University, THE UNIVERSITY OF SHIGA PREFECTURE TEAM, KYOTO UNIVERSITY TEAM, SEIKEI UNIVERSITY TEAM — Weakly-ionized plasma has multiple complexities in various phase spaces of parameters. One of the phase spaces it possesses is a chemical reaction network. To investigate its structure and functions, we proposed a visualization method for complex networks of chemical reactions enhanced by high-energy electrons, based on theories of complex networks; a graph with nodes and edges is efficient for this purpose, where nodes are species like atoms, molecules, radicals, ions and electrons with edges bridging chemical agents and products [1]. To identify roles of species in the network, centrality indices like betweenness and closeness are good measures as microscopic viewers [1,2]. To survey macroscopic and statistical properties of the network, we made a histogram of statistical counting of species for a centrality-index distribution, and plasma-enhanced chemical networks exhibit a wide broadening of the distributions in contrast to cases of random graphs [2]. These facts suggest that web-like plasma enhanced chemical networks are well organized and well balanced to preserve reaction-network stabilities. [1] O. Sakai, K. Nobuto, S. Miyagi and K. Tachibana, AIP Advances 5, 107140 (2015). [2] Y. Mizui, T. Kojima, S. Miyagi and O. Sakai, Symmetry 9, 309 (2017).

Osamu Sakai
The University of Shiga Prefecture

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