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THE S-C-L GRAPH IN CHEMICAL KINETICS

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ABSTRACT. We present two results that provide sufficient conditions for the applicability of the Deficiency Zero Theorem of Horn, Jackson and Feinberg and a theorem due to Vol'pert. In both cases the Species-Complex-Linkage class (S-C-L) graph is assumed to be acyclic.

1. Introduction. The structure of certain graphs induced by chemical reaction networks plays a vital role in the study of chemical kinetics. In this paper the Species-Complex-Linkage (S-C-L) graph which was first introduced by Schlosser and Feinberg will be related to two other graphs, namely, the HJF-graph (standard reaction diagram) studied by Horn-Jackson-Feinberg and the V-graph introduced by Vol'pert. The Deficiency Zero Theorem by Horn, Jackson and Feinberg and a theorem due to Vol'pert give significant information about the qualitative behavior of certain chemical kinetics systems of mass action type based upon their graphical structure. Our results here provide sufficient conditions for the applicability of the two theorems.

2. Definitions and terminology. We will consider a general closed chemical network with n species. An introduction of definitions and terminology is necessary. Our notations are based on [**2, 6, 8**] and [**4**]. It should be understood that we use the standard terminology of graph theory (see, for example, [**5**] and [**1**]).

Definition 1. A *complex* Y^c is a formal linear combination of species, $Y^c = \sum_{i=1}^n \alpha_i A_i$, where A_is denote species. Each stoichiometric coefficient, α_i, is a nonnegative integer and $\alpha_i \neq 0$ for some i. $\widetilde{Y} = \sum_{i=1}^n \alpha_i \mathbf{e}_i$ is the vector corresponding to Y^c, where $\{\mathbf{e}_i\}$ is the standard basis in $\mathbf{R}^n$.

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