

Belousov-Zhabotinsky化学体系中超混沌及其同步的研究

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摘要 曾有报道在Belousov-Zhabotinsky (BZ)体系的实验研究中未实现超混沌。但通过不同类型的变量耦合方式,我们在该体系的Montanator模型中得到了超混沌。发现无论采用何种耦合方式,只要耦合强度足够小,均能得到超混沌。另外,对两个所产生的超混沌BZ体系,在全变量耦合、双变量耦合及K-B空间标量耦合合法的策略下,均实现了同步调制,并且从横截Lyapunov指数判据理论给予验证。探索了个别状态变量在耦合中对同步所起的作用。通过双变量耦合发现[Ce~(4+)]不起作用;通过K-B空间标量耦合合法发现只有[Br~-]和[HBrO_2]的线性组合能起作用,可能由于它们出现在同一个基元反应中。

关键词 [耦合](#) [基元反应](#)

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Study of the Hyperchaos and Their Synchronization in the Belousov- Zhabotinsky Chemical Reaction

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Abstract It has been reported that no hyperchaos could be realized experimentally in the Belousov-Zhabotinsky (BZ) reaction system. However, we obtain the hyperchaos in the Montanator model of the BZ chemical reaction system through various coupling types of the state variables. The results show that hyperchaos is obtainable as long as the coupling strength is weak enough, no matter which types of coupling is employed. In addition, using the variable-coupling schemes and the K-B space scalar coupling scheme, we investigated the synchronization and its mechanism of the hyperchaos generated from the variable-coupling methods. It is found that, in the two variables coupling scheme, [Ce~(4+)] can not act as one of the coupling variables. The other variables can be combined with each other resulting in the synchronization of the hyperchaos, when the coupling strength is beyond certain threshold value. In the K-B spece scalar coupling scheme, only the linear combination of [Br~-] and [HBrO_2] can yield the synchronization of hyperchaos, which may be due to both of them appearing in the same element reaction. As for the coupling of all variables, compared with the coupling of two variables, the synchronization can be obtained at relatively lower threshold value.

Key words [COUPLING](#) [ELEMENTARY REACTION](#)

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