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Nonlinear pattern formation in Dielectric barrier discharge LIFANG DONG, WEILI FAN, YAFENG HE, College of Physics Science & Technology, Hebei University, PATTERN FORMATION IN DBD TEAM — Dielectric barrier discharge (DBD) has proven to be a fascinating system for the study of nonlinear pattern formation, which presents an extraordinary variety and richness of patterns with the prominent convenience and practicality of experimental setups. In recent years, by using the special designed DBD system with two water electrodes, we have obtained a rich variety of patterns through nonlinear self-organization of the filaments [Phys. Rev. E 87, 042914 (2013), Phys. Rev. E 85, 066403 (2012), Phys. Rev. E 86, 036211 (2012)]. The spatio-temporal dynamics of these patterns have been studied systematically, and furthermore, the detailed plasma diagnostics have been carried out. These results are of great significance to give deep insight into the nature of nonlinear pattern formation. Based on our previous studies, here we will present the first report on a new complex superlattice pattern, as so called concentric superlattice. It evolves from hexagon pattern and transits to homogenous glow discharge with an increasing of the applied voltage. The spatio-temporal dynamics of the patterns have been investigated by a high speed camera. Results show that the concentric superlattice is an interleaving of three different sub-lattices, which are concentric-ring, concentric-framework, and concentric-dot embedded in the concentric-framework. Based on the experimental measurements, the involved intrinsic physical mechanism will be demonstrated.

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