SIR - Röder et al. report nanometre-scale structures built by deposition of diffusing particles that aggregate on surfaces [1]. We report a computer model that mimics the same process, and produces morphologies that remarkably resemble the experimental structures. The model is defined as follows:

(a) *Deposition*. Particles are deposited at randomly-chosen positions of the surface at a flux \( F \) per lattice site per unit time.

(b) *Diffusion*. A cluster of connected particles is chosen at random and moved North, East, South or West by one lattice constant with a probability proportional to its mobility, which is given by \( D_s = D_1 s^{-\gamma} \), where \( s \) is the number of particles in the cluster, \( D_1 \) is the diffusion constant of the monomers and \( \gamma \) characterizes how the mobility of a cluster depends on its size.

(c) *Aggregation*. If two particles come to occupy neighboring sites, they stick irreversibly.

The model can be tested by explicit comparison with the experimental data of [1], since there are no free parameters provided we introduce the experimental values for the flux and the diffusion constant. The diffusion constant of the monomers is given by \( D_1(T) = D_0 \exp(-E_d/kT) \) with \( E_d = 0.14eV \) [1], and \( D_0 = 5 \times 10^{11} \) [2]. Using the experimental values of the fluxes, we find \( F/D_1 = 10^3 \) corresponds to Fig. 1a of [1], and \( F/D_1 = 10^{-10} \) to Fig. 1d. Figs.1a,b show results of the model with these flux values, and we note that the morphologies compare well with Figs. 1a and 1d of [1].

In general, the model allows one to distinguish the effects of deposition, diffusion and aggregation. We find that tuning the relative strength of, e.g., deposition and diffusion, generates a rich range of morphologies—including diffusion limited aggregation, cluster-cluster aggregation, and percolation [3]. The length and time scales characterizing these morphologies depend on experimentally-controllable parameters like deposition flux, and diffusion constant, raising the possibility that the model can be used for a controlled design.
of nonostructure morphologies. Indeed, the model makes specific predictions, for example that the typical size of the DLA-like structures scales as $(F/D_1)^{1/4}$.

The model may be useful in many situations where diffusion occurs in the presence of continuous deposition. The model was originally motivated by thin film deposition experiments in which not isolated atoms but rather aggregates made up of compact spherical "molecules", $\approx 5$ nm diameter containing $\approx 2000$ atoms are deposited on a surface [4]. The morphologies of Figs. 1a,b also resemble experimental images obtained by such LECBD experiments on substrates maintained at low temperatures (compare Fig. 1b to Fig.3 of Ref.4).

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Fig.1: Morphologies obtained in the present model for two different values of flux $F$, diffusion constant $D_1$, and total surface coverage all chosen to correspond to the experimental parameters used in obtaining the data shown in Figs. 1a and 1d of Ref.1. (a) $F/D_1 = 10^3$, and total coverage of 0.012 (b) $F/D_1 = 10^{-10}$, and total coverage of 0.12. The simulation lattice had $200 \times 200$ sites; the portion shown here corresponds to Figs. 1a and 1d of Ref.1, which are also a portion of the total experimental system. We set $\gamma = 10$ (larger clusters rarely move—J.P. Bucher, private communication).