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## FROM QUARK CORRELATIONS TO VIRTUAL CLUSTERS IN NUCLEI

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We propose the quark model of nuclear structure where quark correlations lead to nucleon-nucleon correlations and arrangement of them into lattice-like structure. The model is based on the quark model of nucleon structure in which valence quarks are strongly correlated within a nucleon (SCQM). Nuclei are built by junctions of SU(3) color fields of two quarks of neighboring nucleons. Application of the model to the larger collections of nucleons reveals the emergence of the face-centered cubic (FCC) symmetry at a nuclear level where nucleons arrange in alternating spin-isospin layers. The model becomes isomorphic to the shell model and composes the features of the liquid drop and cluster models. It turns out that building blocks of the nuclear structure are three-nucleon and four-nucleon configurations. These configurations form inside nuclei virtual triton,  $^3\text{He}$  and  $\alpha$ - clusters. Applying the model to construct the isotopes of He and Li nuclei we demonstrate that 'halo' nuclei are consequences of quark loops forming three-nucleon configurations. The model can predict the boundary of the maximal number of neutron excess, i.e. neutron drip line. Also we apply the model to analyze nucleosynthesis in stars in the framework of  $\alpha$ -clustering.

1. G. Musulmanbekov, PEPAN Lett. № 5, p. 548 (2021); Adv. Nucl. Sci. Appl., v1, № 2, p. 105 (2025); <https://doi.org/10.63907/ansa.v1i2.34>
2. G. Musulmanbekov, Adv. Nucl. Sci. Appl., v1, № 4, p. 250 (2025); <https://doi.org/10.63907/ansa.v1i4.53>.

**Primary author(s) :** MUSULMANBEKOV, Genis (JINR)

**Presenter(s) :** MUSULMANBEKOV, Genis (JINR)

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