Stable and Metastable Quasicrystalls in Al-Based Multicomponent Systems with *d*-Metals

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The present report deals with a number of questions on physical chemistry of the binary and ternary alloys of Al with TM containing quasicrystals (QCs) and related periodic phases, including recent original data.

Metastable binary QCs were obtained for all the Al-based systems with *d*-metals, beginning from V, Mo or W in the *d*-*M* rows of Periodic System. No stable binary QC was found.

Stable and metastable ternary QCs were found in the Al-based ternary systems Al-*dM*-Ni(Pd,Cu), where *dM* is a metal from VII and VIII groups of Periodic System for the exception of Ni, Pd and possibly Pt. Stable QCs can be treated as solid solutions being ternary extensions of metastable binary phases which are stabilized with third component (Ni, Pd or Cu) in ternary systems.

About 100 QCs phases are reported up today; among them there are 60 phases containing Al. There are data on phase equilibria (reliable or not) for 15 Al-based ternaries. Among them the Al-Ni-Co, Al-Ni-Ru, Al-Pd-Co and Al-Pd-Mn systems can only be considered as studied in detail in whole concentration and rather wide temperature ranges. It may be supposed ternary stable or metastable QCs to form in unstudied ternaries Al-Ni-Mn(Tc,Rh,Os,Ir), Al-Pd-Rh(Ir) and Al-Cu-Mn(Tc,Re,Os,Ir).

Definite electron conditions have to be considered as a demanded condition of QC formation. There are arguments in favor of essential role of atomic radii's ratio of components. A contribution of entropy factor in stabilizing of QCs, which are high temperature phases of "changing" composition has to be important as well.