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Comment on the paper "Experimental investigation of the Ni-V-W ternary phase diagram", Calphad: Comput. Coupling Phase Diagrams Thermochem. 76 (2022) 102384.

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In a recent paper [1], Meifang Tang *et al.* report an investigation of the ternary Ni–V–W system. Though this is not the main subject of their paper, they mention results related to the binary Ni–W system that need to be commented.

In one ternary alloy (sample A13), they found a phase of measured composition $Ni_{50.33}V_{0.36}W_{49.31}$. This phase was identified as corresponding to the (slight) ternary extension of WNi binary phase. They therefore conclude on the existence of this phase in the binary Ni–W system. They also mention and take into account in the thermodynamic assessment the NiW_2 phase, though they do not provide any experimental result about this phase.

However, in a previous (not-cited) work, Cury *et al.* [2] had shown that there is no compelling evidence for the existence of the two previously reported phases NiW and NiW_2. Previous evidence is actually better interpreted in terms of the presence of the two ternary carbides Ni_6W_6C and Ni_2W_4C that would have been taken mistakenly for binary phases. It was later shown that, similarly, the so-called FeW phase in the Fe-W system corresponds also probably to the ternary Fe_6W_6C phase [3]. The results on Ni–W system have been confirmed since then by several authors, see *e.g.* [4-7]. In particular, in Ref. [6], Isomäki *et al.*, made a complete review (see references therein) and reach the same conclusions.

Any discussion is absent from the paper of Meifang Tang *et al.* to rebute the arguments developed in previous literature. The statement 'In their (Isomäki's) assessment, the WNi phase is considered to be metastable' is misleading. Contrary to what is suggested by the authors, the conclusions by Isomäki are not based on first-principles calculations but rather on a careful literature review. Their conclusion is that the so-called NiW does exist and is in fact a ternary carbide. This is not a question of 'metastability'.

The conclusions of Meifang Tang *et al.* are based on EDS analysis and an X-ray diffraction pattern. No analysis of the carbon content by EDS is provided to support the conclusion that the 'WNi' phase is truly an intermetallic compound. The diffraction pattern of sample A13 is shown with an indexation of WNi phase for phase 3. But, the crystal structure used for the indexation is not provided. It is supposed it comes from the old literature reporting the existence of this phase for which no crystal structure has ever been reported. A careful look shows that the diffraction lines of phase 3 can actually be very well indexed by the diffraction pattern simulated with the crystal structure of the ternary carbide Ni_6W_6C [8] (Fig. 1). This diagram instead of being a proof of the existence of WNi turns to be a proof that the authors actually have a ternary carbide instead.

This clarification on the binary Ni–W system does not cast doubt on the rest of the study. This is a minor point in the publication of the ternary Ni–V–W system. It is however important to avoid introducing new confusions in the literature as far as the binary system is concerned. Note also that the same authors made the same misinterpretation of their results in the Ref. [9] on the Mo–Ni–W system.

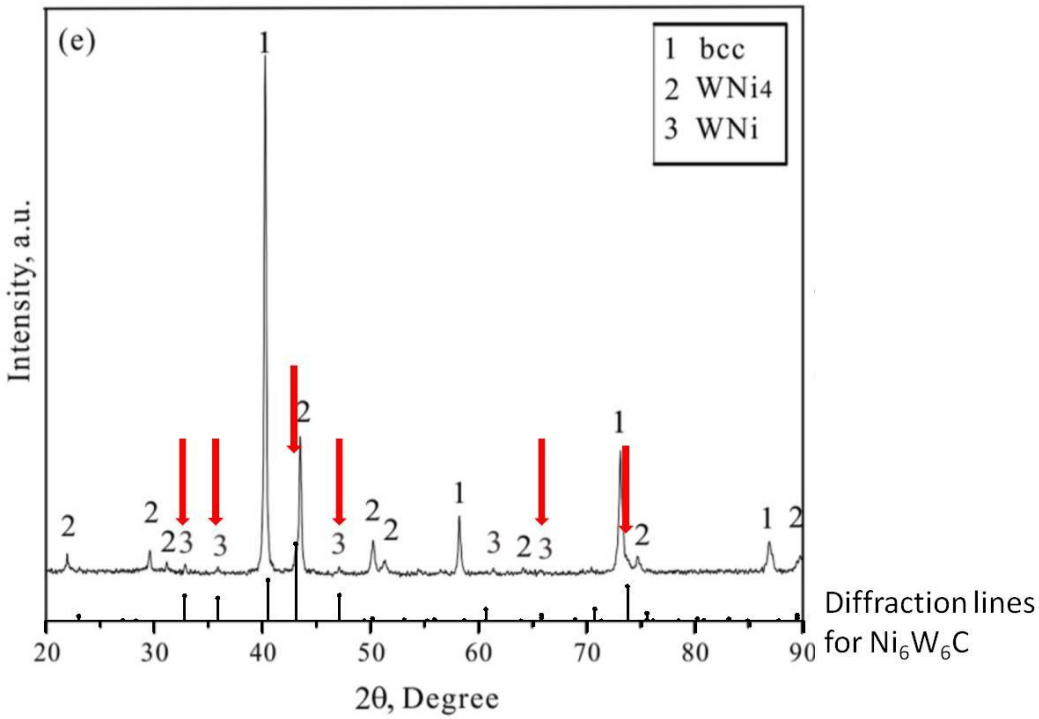

Fig. 1. Diffraction pattern of sample A13 in Ref. [1] with superposition of the calculated pattern of Ni_6W_6C [8] (black) and visible diffraction lines indexed by this carbide (red arrows).

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