MAGNETIC SYMMETRY OF THE PLAIN DOMAIN WALLS IN THE PLATES OF CUBIC FERRO- AND FERRIMAGNETS

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The investigation of static and dynamic properties of domain walls (DWs) in magnetically ordered media is a considerable interest for the physical understanding of medium behavior and it is also important for applications. For sequential examination of these properties it is necessary to take into account their magnetic symmetry [1,2]. The complete symmetry classification of plane 180°-DWs in magnetically ordered crystals [1] and similar classification of these DWs with Bloch lines in ferromagnets and ferrites [2] where carried out earlier. The DW symmetry dependence on the magnetic sample shape was not considered previously. Consideration of the DW symmetry in an arbitrary oriented plate of the arbitrary cubic ferro- and ferrimagnets is the purpose of this work.

As it was shown [1] the DW symmetry can be described by the magnetic symmetry classes (MSCs) G_k where k is a MSC number. These MSCs describes the DW magnetization distribution symmetry. Sample shape reduces or doesn't change the DW symmetry. The MSC G_P of restricted sample of crystal in paramagnetic phase is $G_P = G_P^{\infty} \cap G_S$ where G_P^{∞} is crystal paramagnetic phase MSC [1,3] and sample shape MSC G_S is $\infty/\mathrm{mmm}1'$ for volumetric plate. MSCs of DWs should satisfy the condition: $G_k \subset G_P$. We present MSCs G_k of the plain DWs of arbitrary type and magnetization turn in arbitrary oriented plates of cubic symmetry crystals. Example in table is given for 180°-DW in $\mathrm{m}\bar{3}\mathrm{m}$ crystal.

Table. Magnetic symmetry of the 180°-DW in the plates of cubic $\mathrm{m}\bar{3}\mathrm{m}$ crystal

<table>
<tr><td rowspan="4">Plate orient., G_P</td><td colspan="4">$\{100\},\ 4/\mathrm{mmm}1'$</td><td rowspan="4">$\{111\},\ \bar{3}\mathrm{m}1'$</td></tr>
<tr><td rowspan="3"></td><td colspan="3">$\{110\},\ \mathrm{mmm}1'$</td></tr>
<tr><td rowspan="2"></td><td colspan="2">$\{nm0\},\{nmm\},2/\mathrm{m}1'$</td></tr>
<tr><td></td><td>$\{nml\},\ \bar{1}1'$</td></tr>
<tr><td rowspan="5">G_k without inversion operations (G_k with inversion operations)</td><td>$4(4/\mathrm{m}')$</td><td>$22'2'(\mathrm{mmm}')$</td><td>$2'(2'/\mathrm{m})$</td><td>$1(\bar{1}')$</td><td>$3(\bar{3}')$</td></tr>
<tr><td>$422(4\mathrm{m}'\mathrm{m}')$</td><td>$(\mathrm{mm}'2')$</td><td>$(\mathrm{m})$</td><td>-</td><td>$32(3\mathrm{m}')$</td></tr>
<tr><td>$(4/\mathrm{m}'\mathrm{m}'\mathrm{m}')$</td><td>$(\mathrm{mm}2)$</td><td>$2(2/\mathrm{m}')$</td><td>-</td><td>$(\bar{3}'\mathrm{m}')$</td></tr>
<tr><td>$(\bar{4}2\mathrm{m}')$</td><td>$222(\mathrm{m}'\mathrm{m}'\mathrm{m}')$</td><td>$(\mathrm{m}')$</td><td>-</td><td>-</td></tr>
<tr><td>$(\bar{4}')$</td><td>$(\mathrm{m}'\mathrm{m}'2)$</td><td>-</td><td>-</td><td>-</td></tr>
</table>

References
[1] Baryakhtar V., Lvov V. and Yablonsky D. 1984 *JETP* **87** 1863
[2] Baryakhtar V., Krotenko E. and Yablonsky D. 1986 *JETP* **91** 921
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