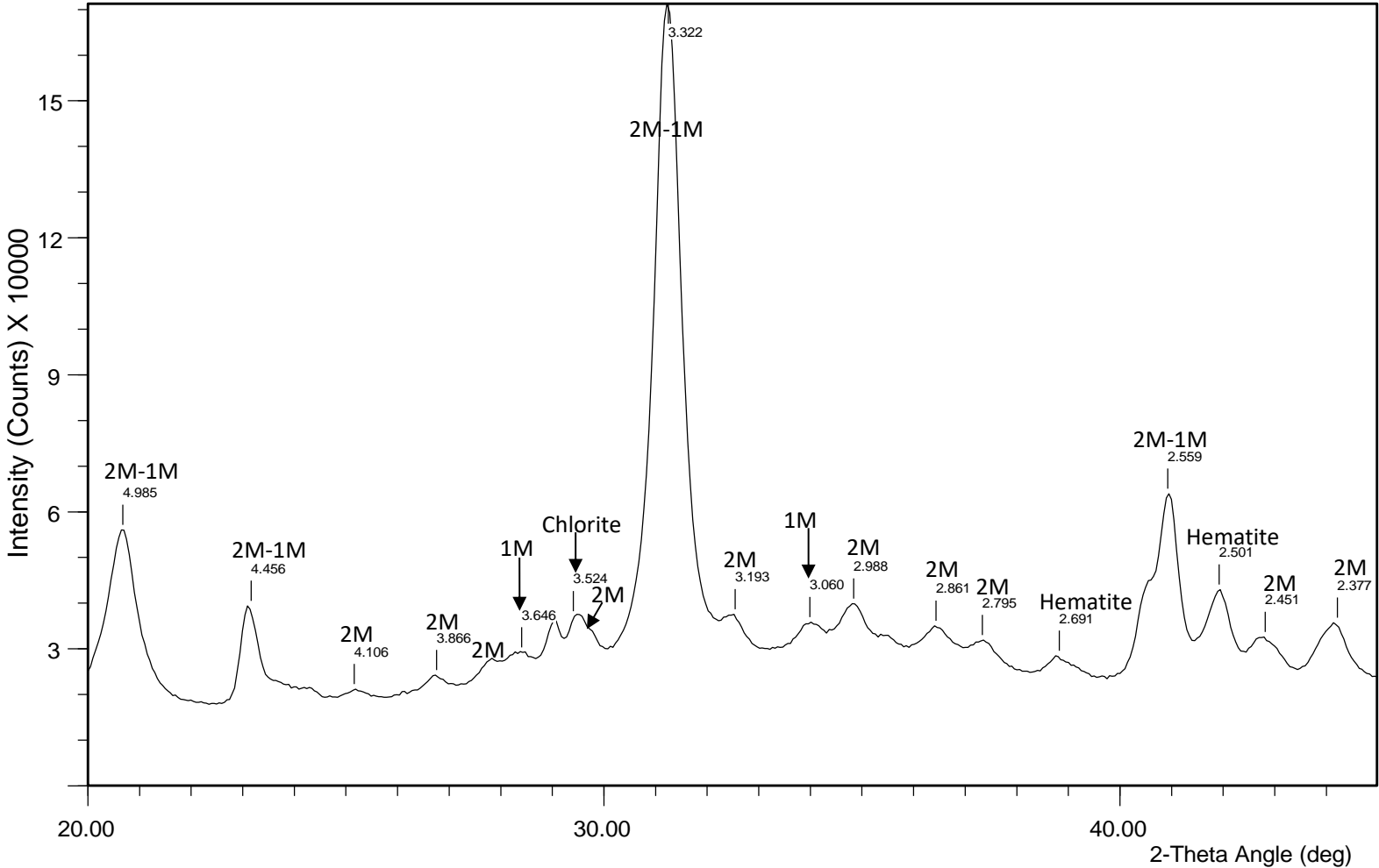


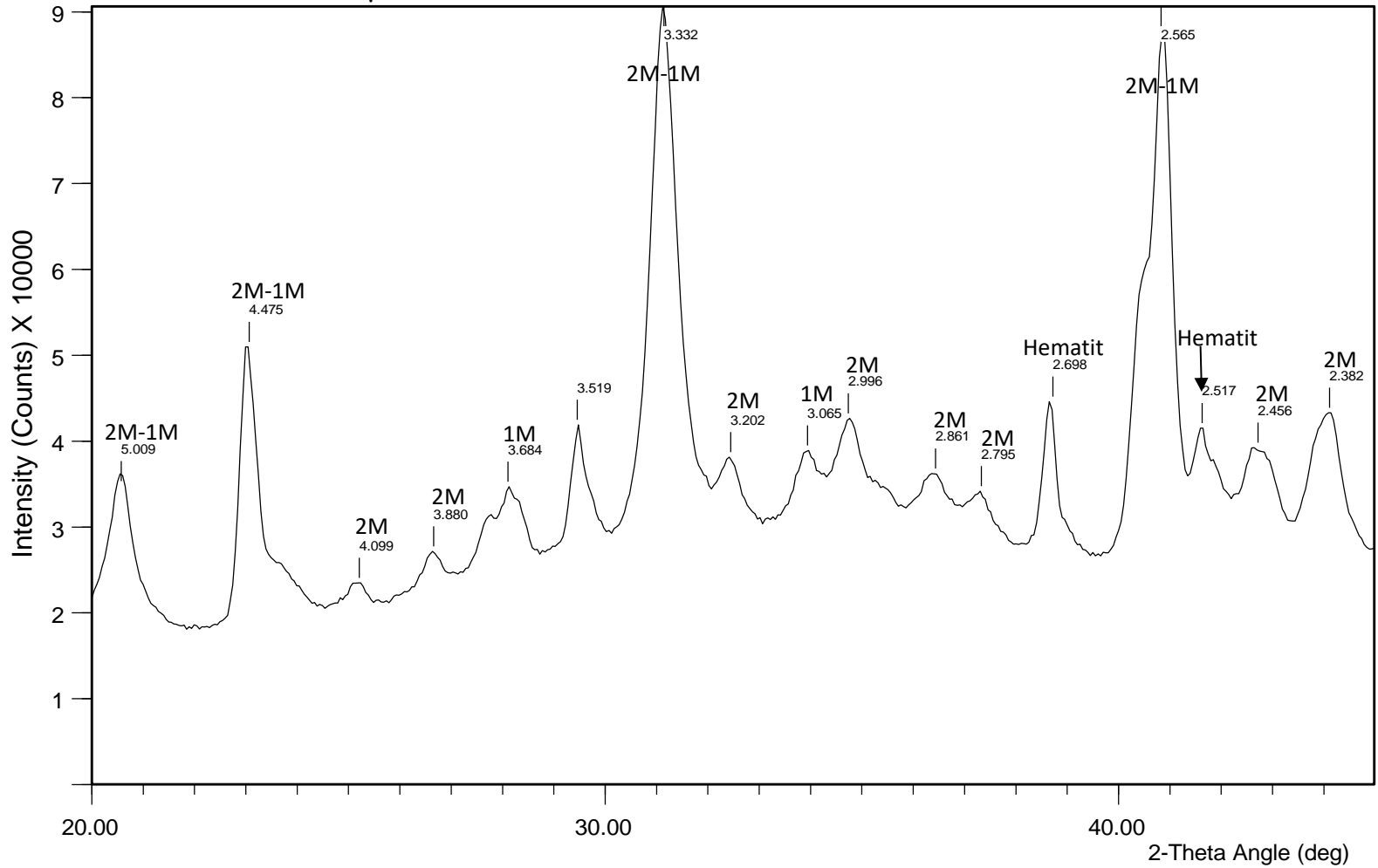
Figure S1. XRR pattern of fault gouges and matrix clays in host sandstones from the Millungera Basin, which have been used for K–Ar, Ar–Ar, and Rb–Sr dating.

XRD PATTERN FOR RANDOM POWDER CLAY FRACTIONS

Sample ID JC-343.3 <2μm

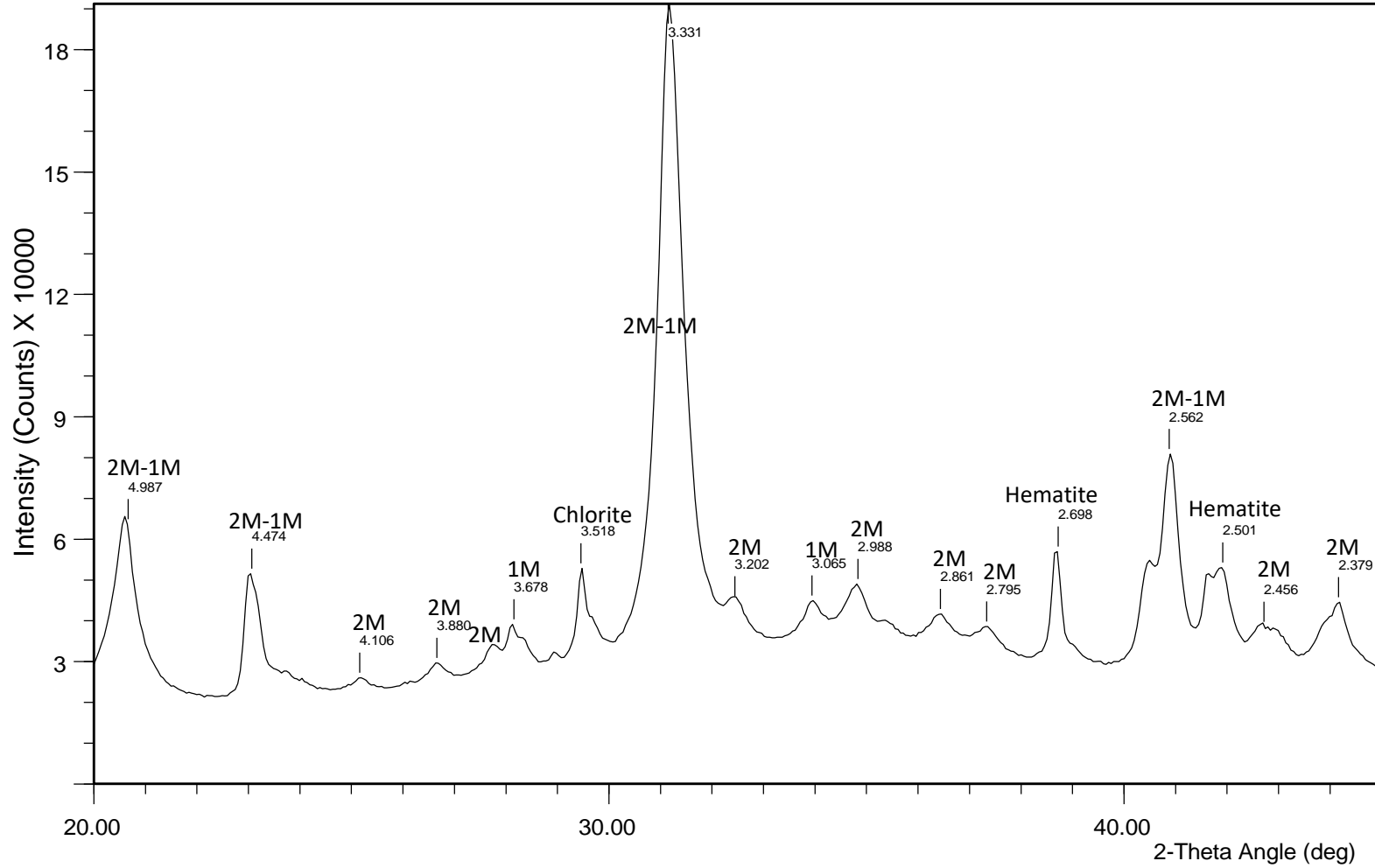


Sample ID JC-360.7 <2μm



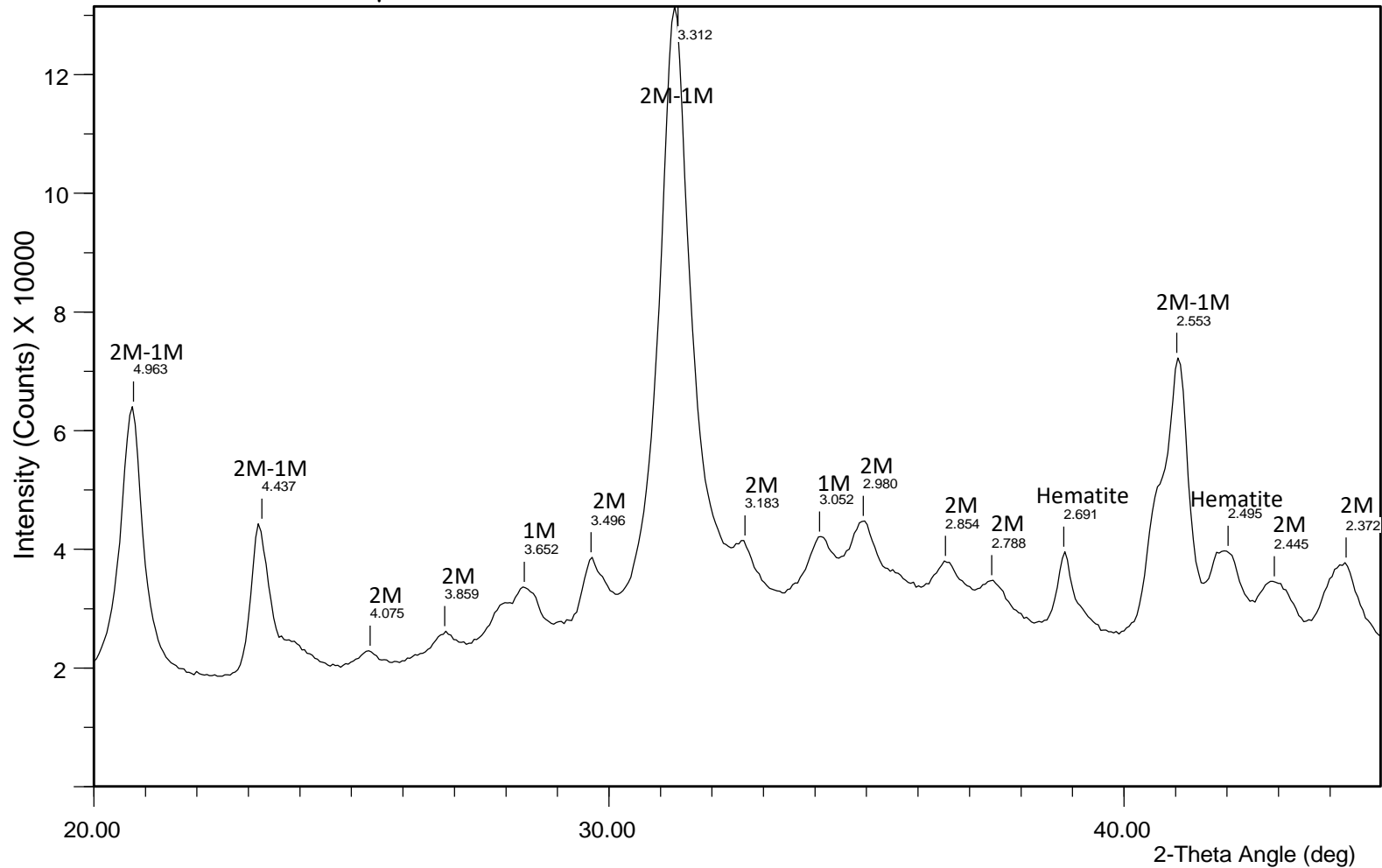
File Name: c:\...\milungerabasin\jc360.7 -2 backpack2.cpi

Sample ID JC-360.7 2-1 μ m



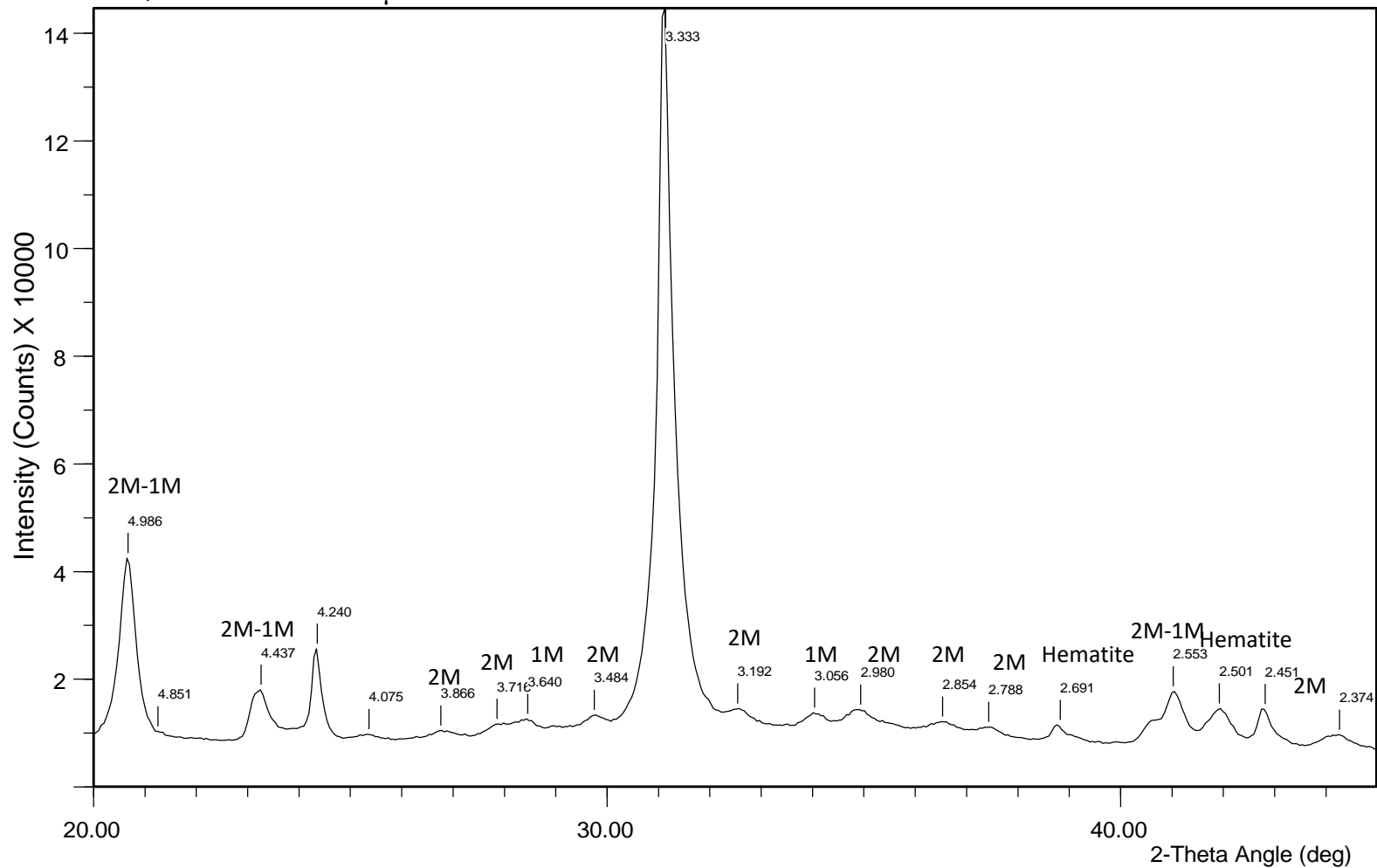
File Name: c:\...\milungerabasin\jc360.7 2-1 backpack.cpi

Sample ID JC-360.7 <1 μ m



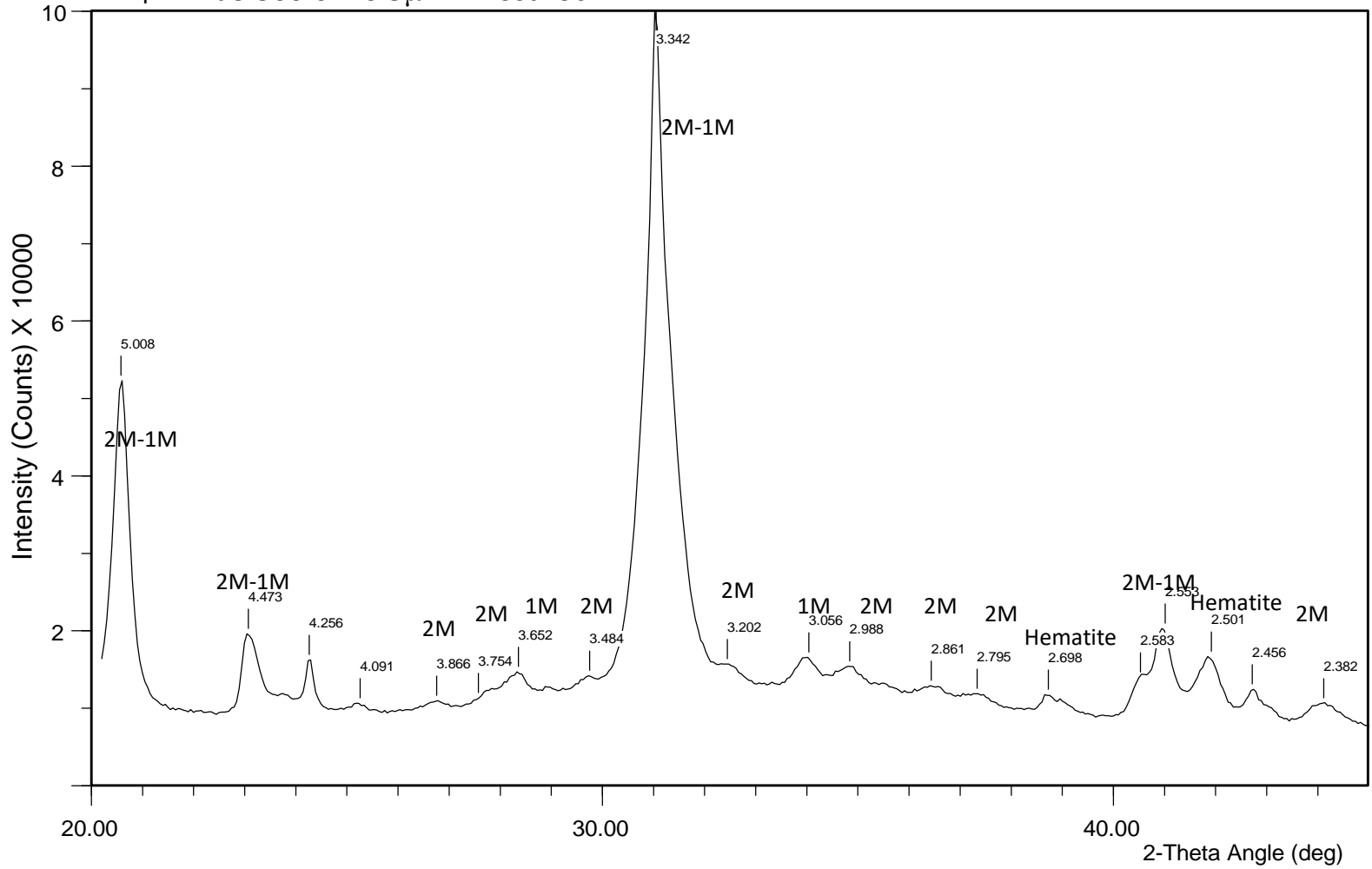
File Name: c:\...\milungerabasin\jc360.7-1 backpack.cpi

Sample ID JC-360.6 2-1 μ m – host rock



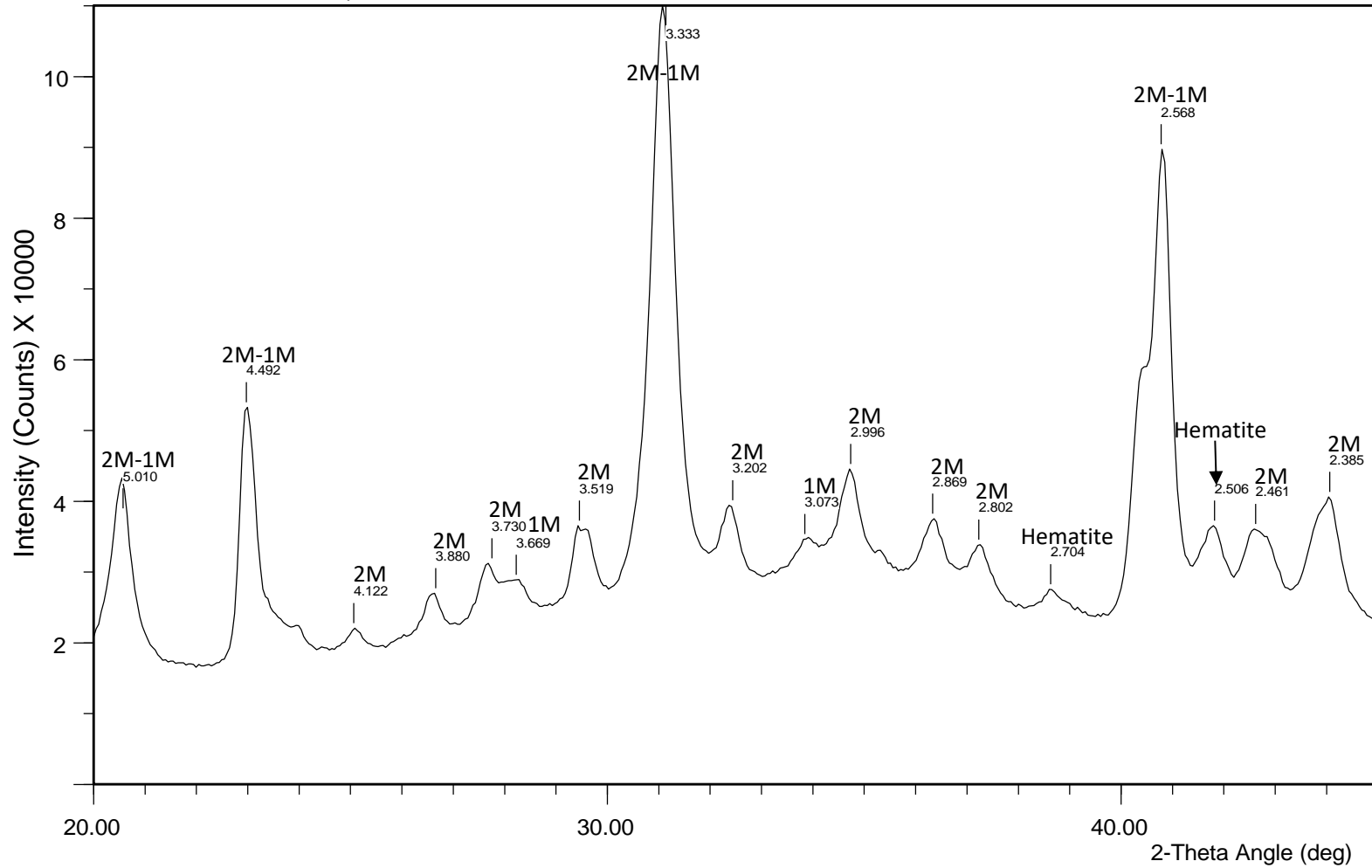
File Name: c:\...\milungerabasin\jc360.6 2-1 polytype.cpi

Sample ID JC-360.6 1-0.5 μ m – host rock



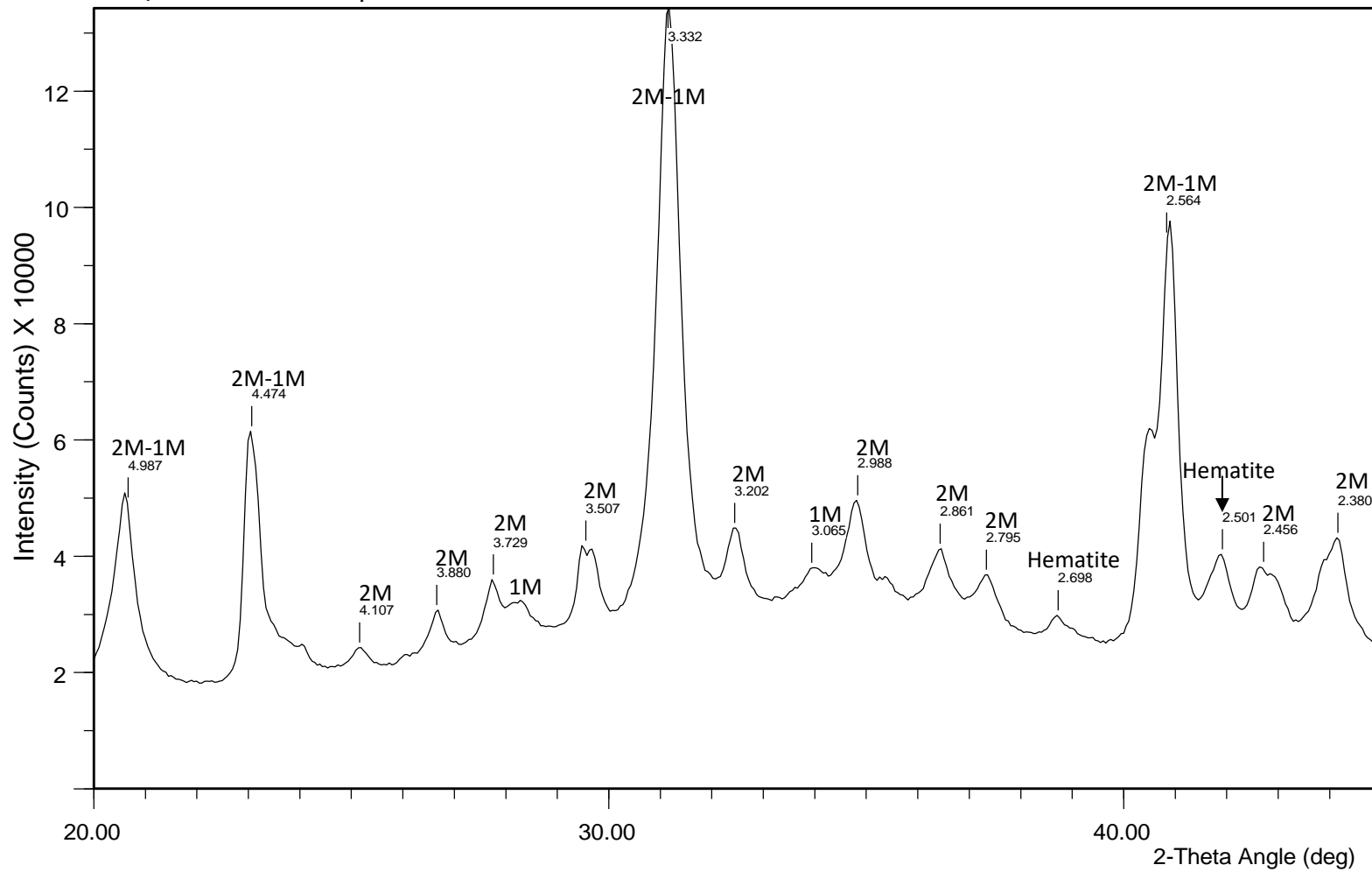
File Name: c:\...milungerabasin\jc360.6 1-0.5 polytype.cpi

Sample ID JC-408 <2μm



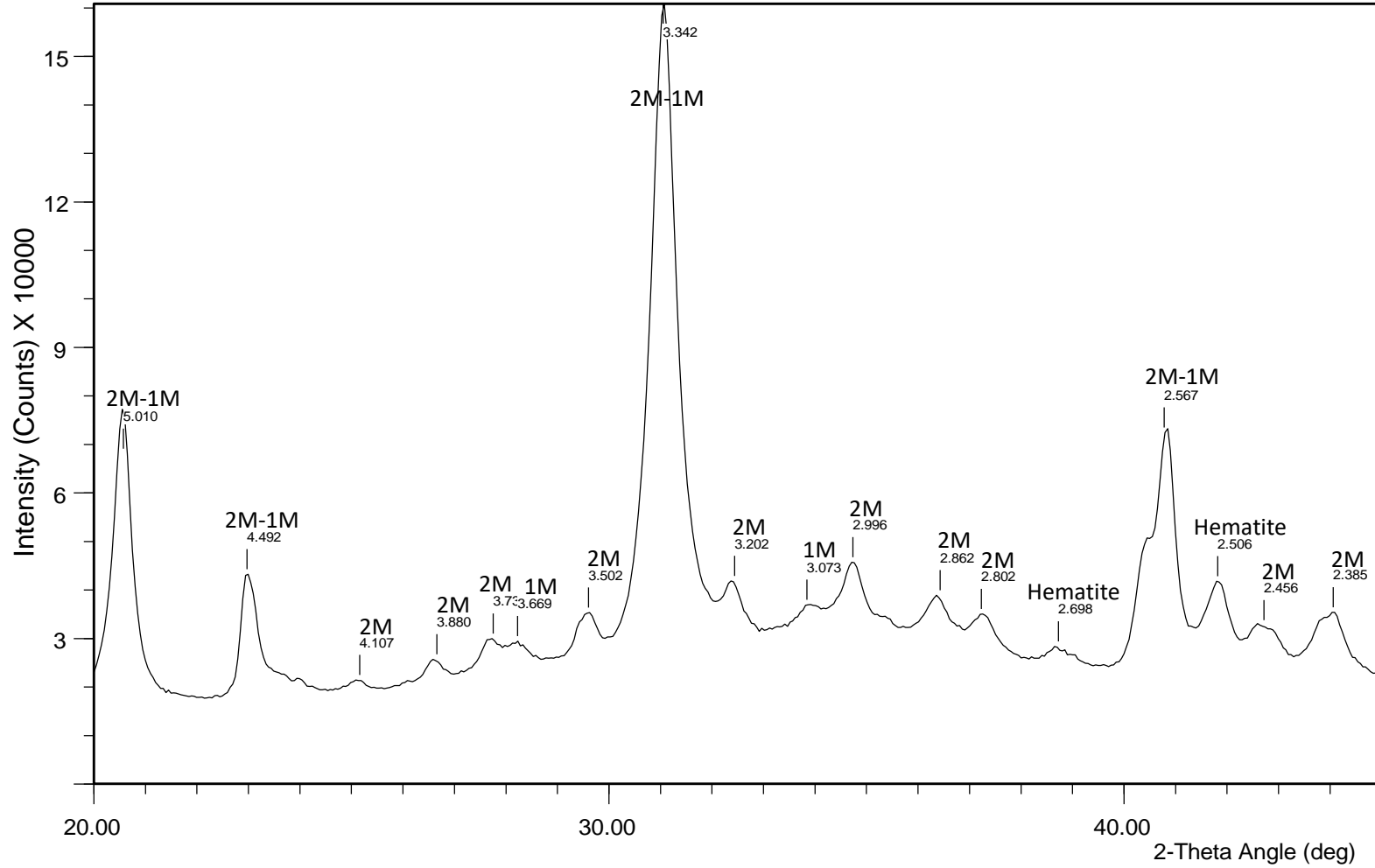
File Name: c:\...milungerabasin\jc408-2 backpack.cpi

Sample ID JC-408 2-1 μ m



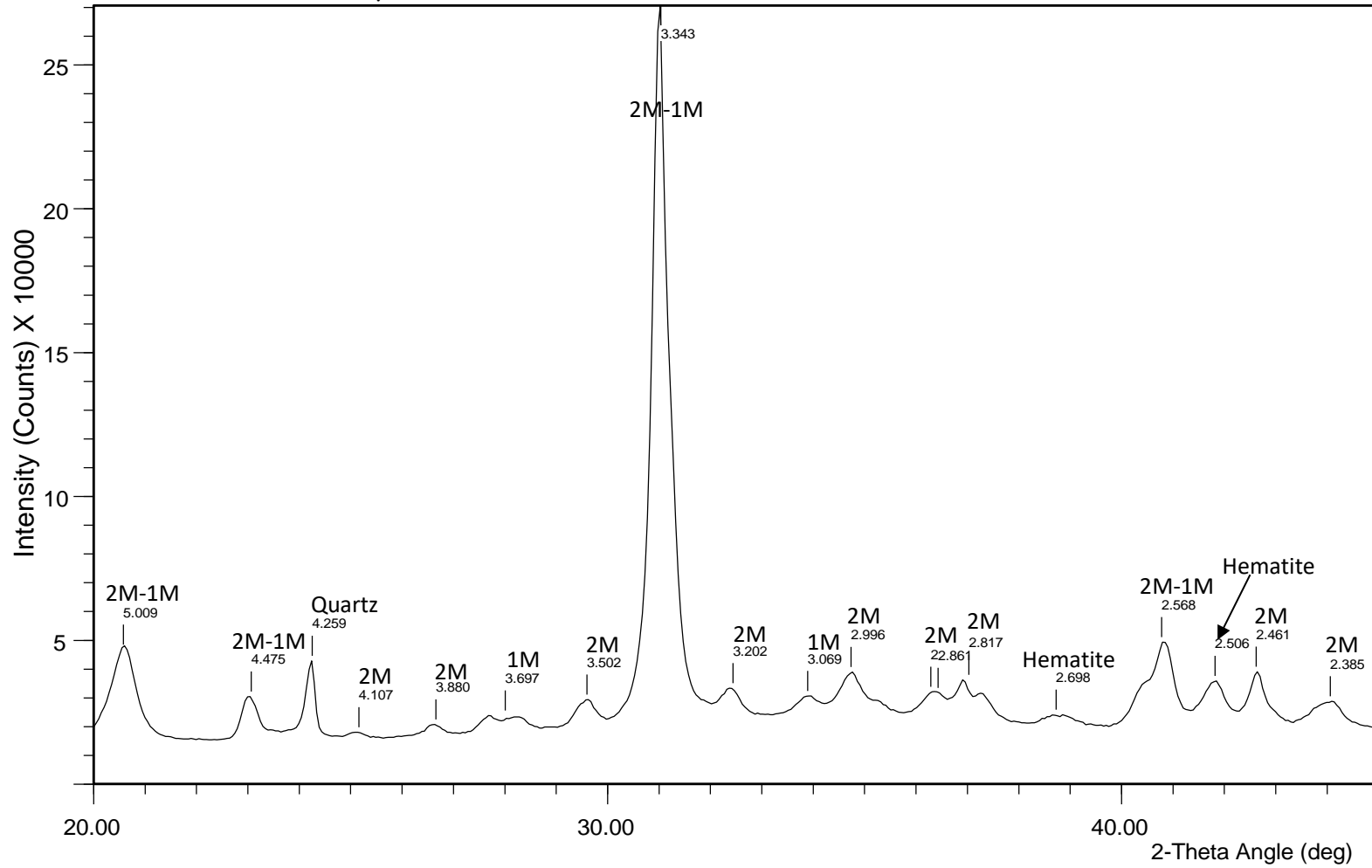
File Name: c:\...\milungerabasin\jc408_2-1 backpack.cpi

Sample ID JC-408 <1μm



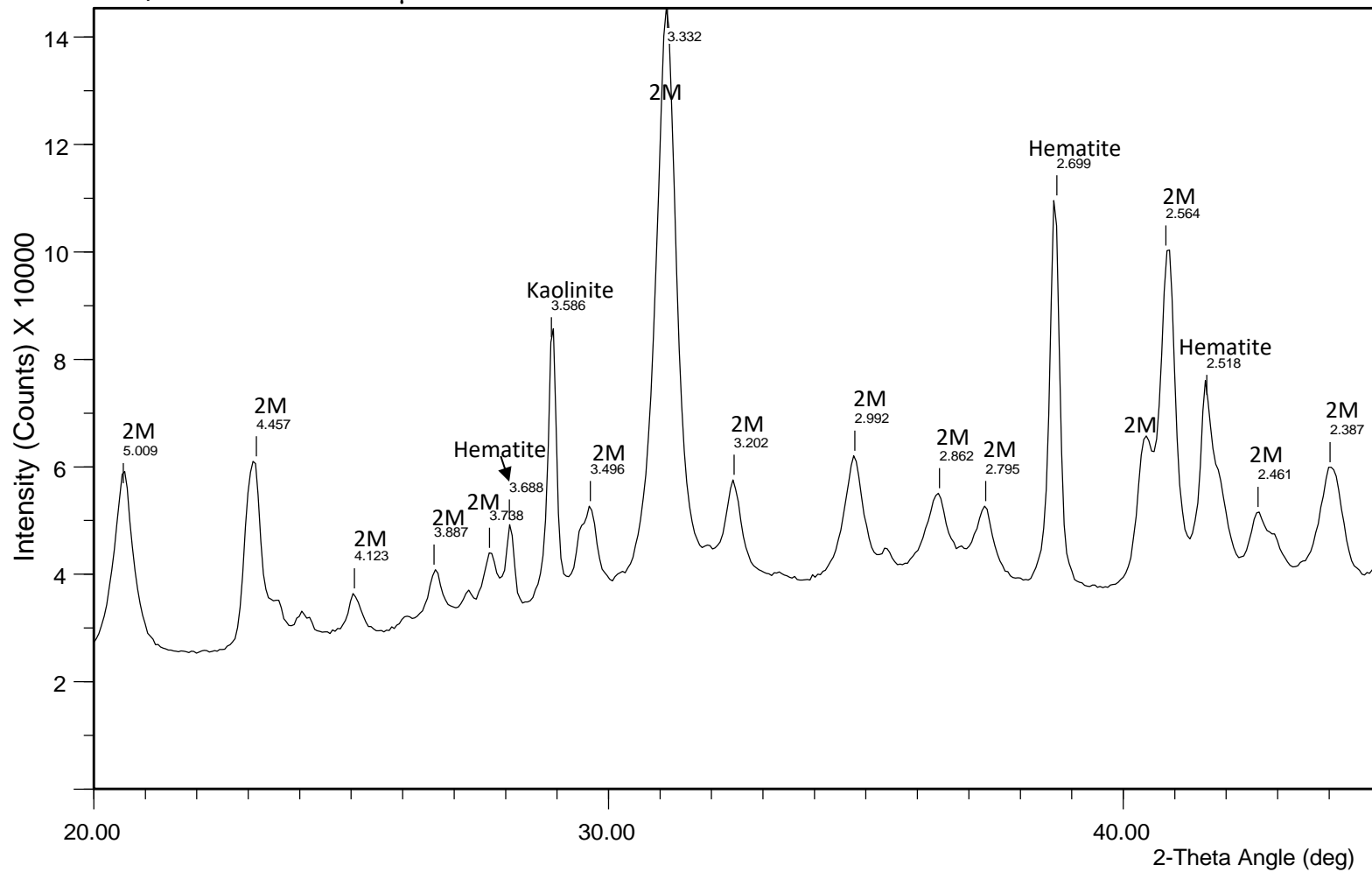
File Name: c:\...\milungerabasin\jc408-1 backpack.cpi

Sample ID JC-440.5 <2μm



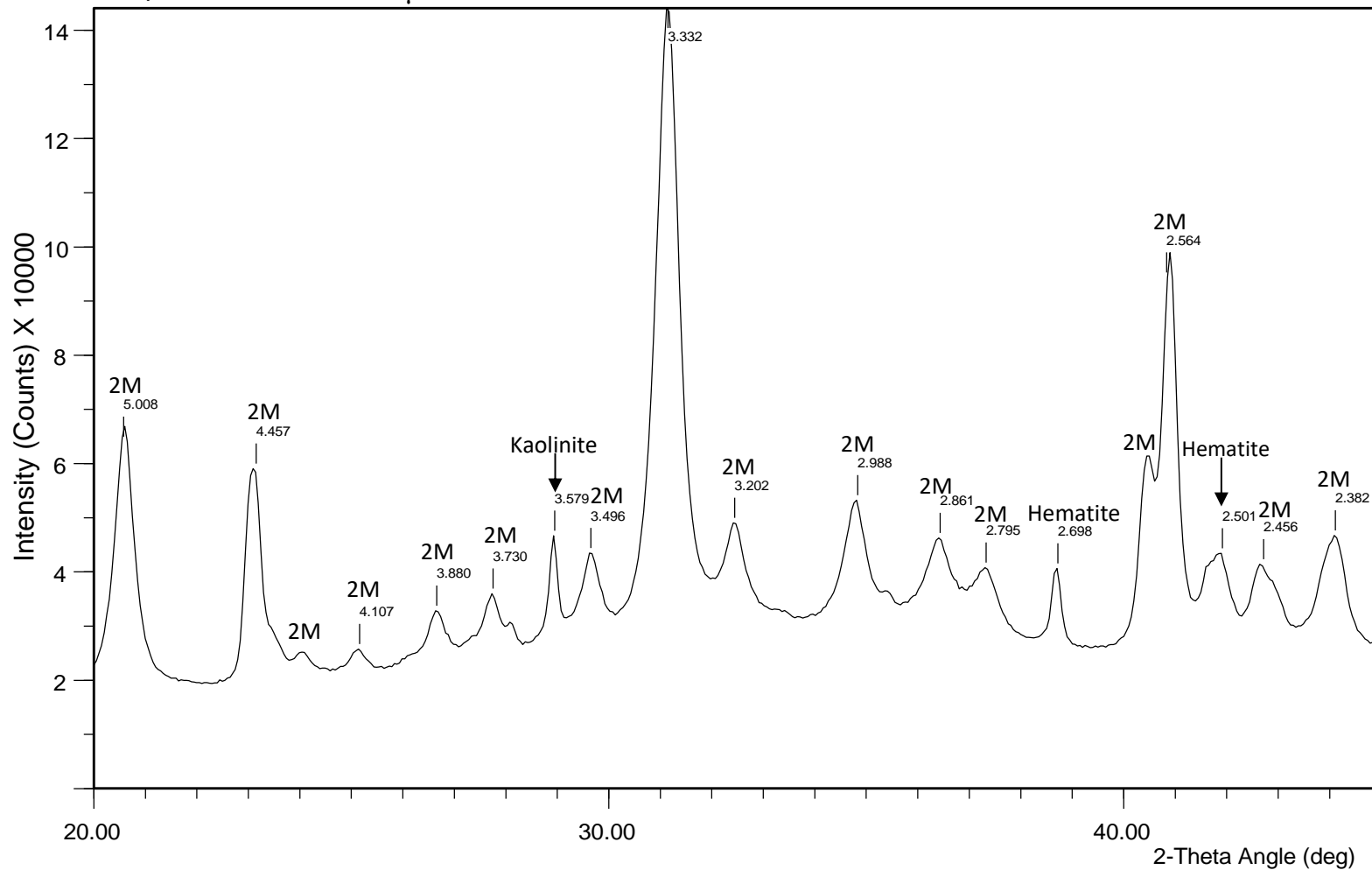
File Name: c:\...\milungerabasin\jc440.5-2 backpack.cpi

Sample ID Dob-389.6 <2μm



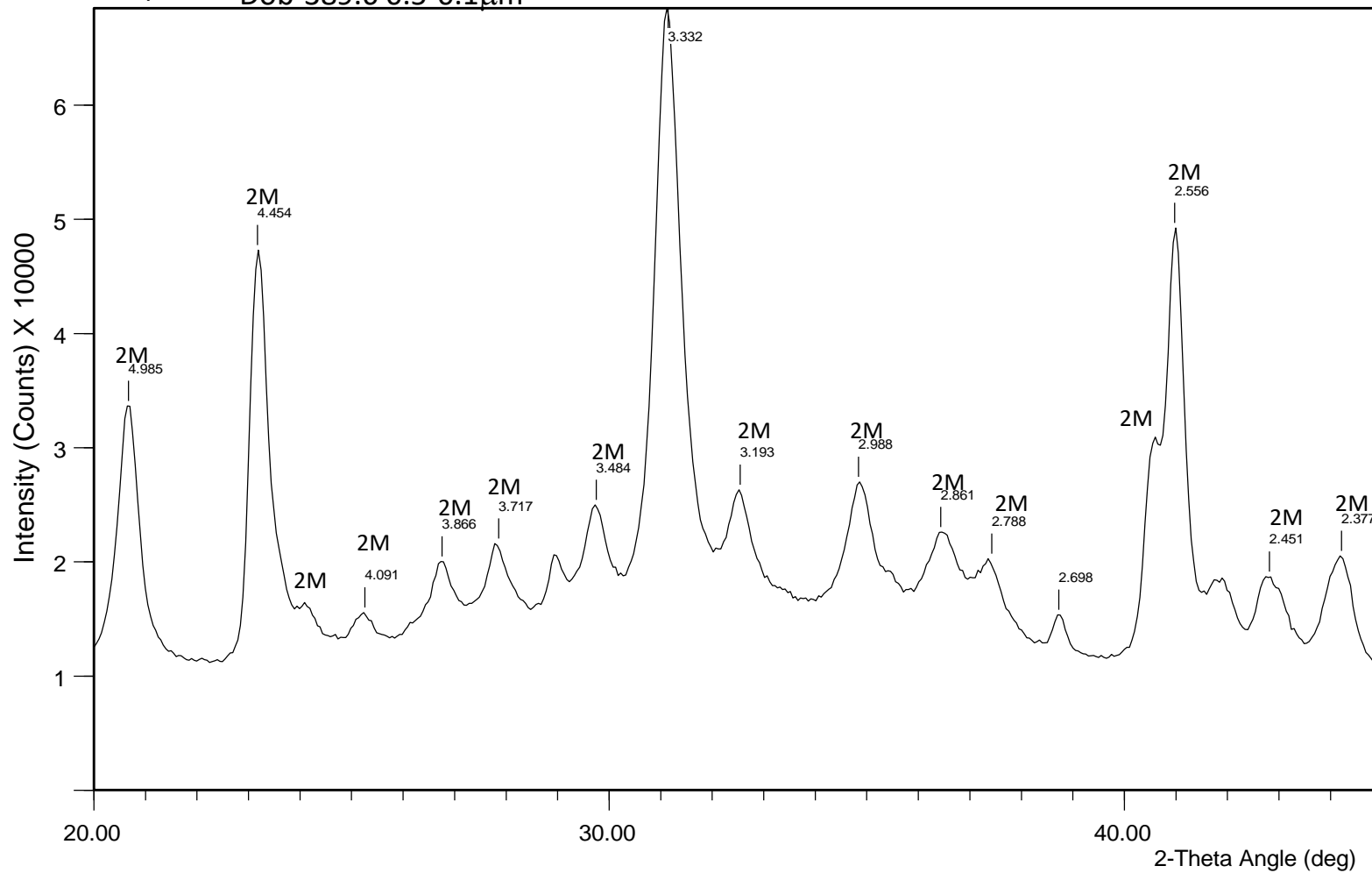
File Name: c:\...\milungerabasin\db389-2 backpack.cpi

Sample ID Dob-389.6 <1 μ m



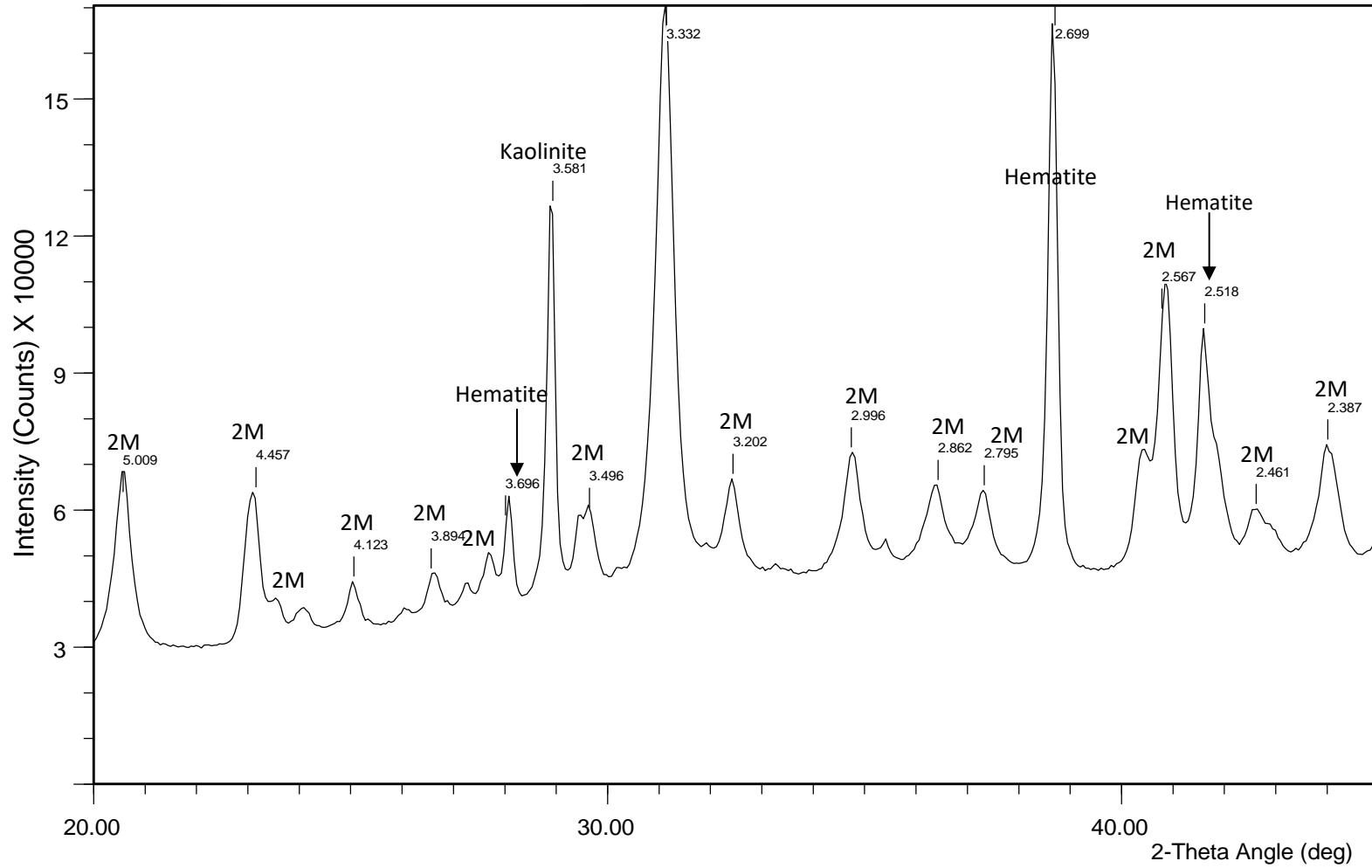
File Name: c:\...\milungerabasin\db389-1 backpack.cpi

Sample ID Dob-389.6 0.5-0.1 μ m



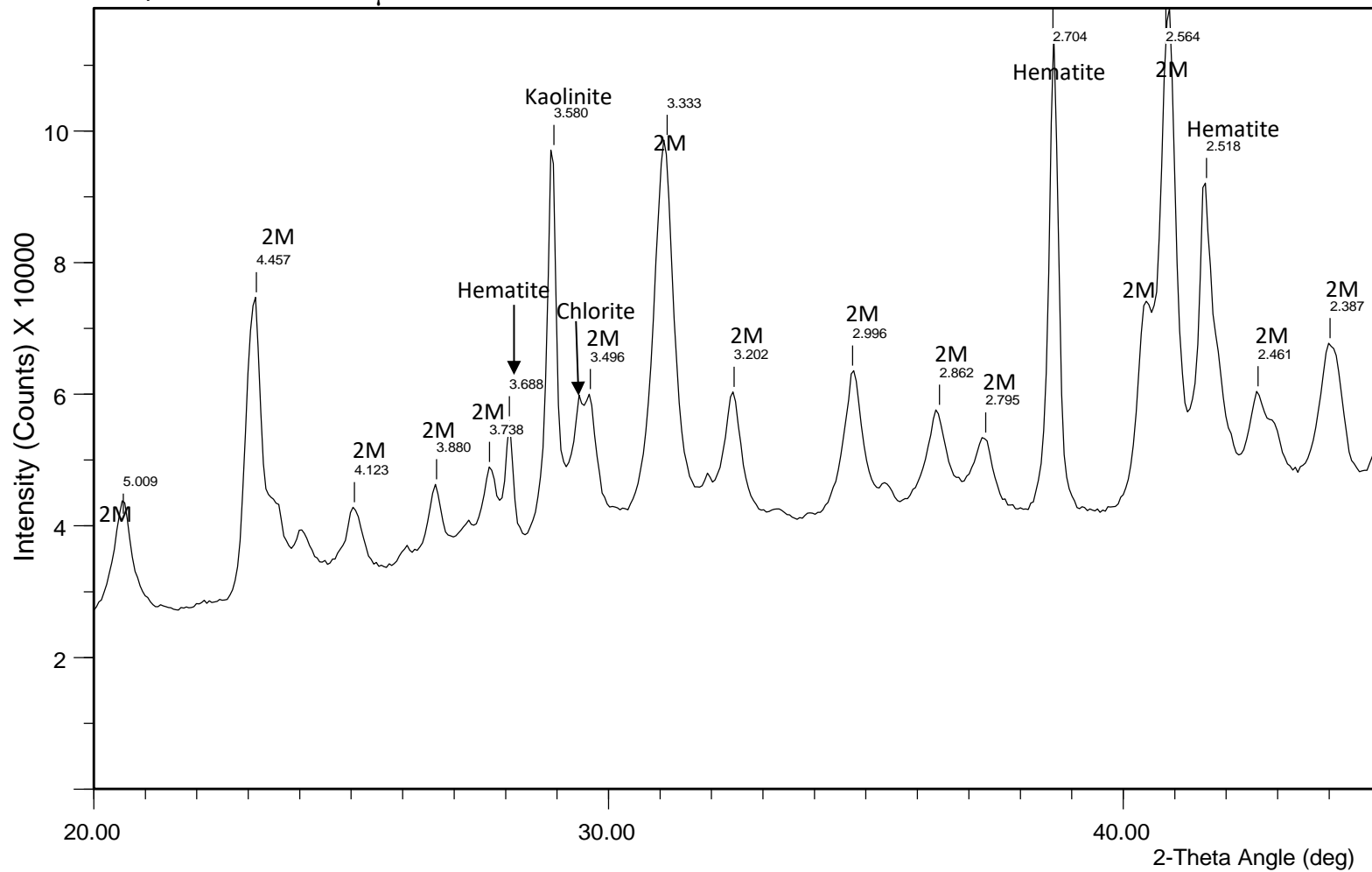
File Name: c:\...\milungerabasin\db389.6 0.5-0.1r.cpi

Sample ID Dob-389.6 2-1 μ m



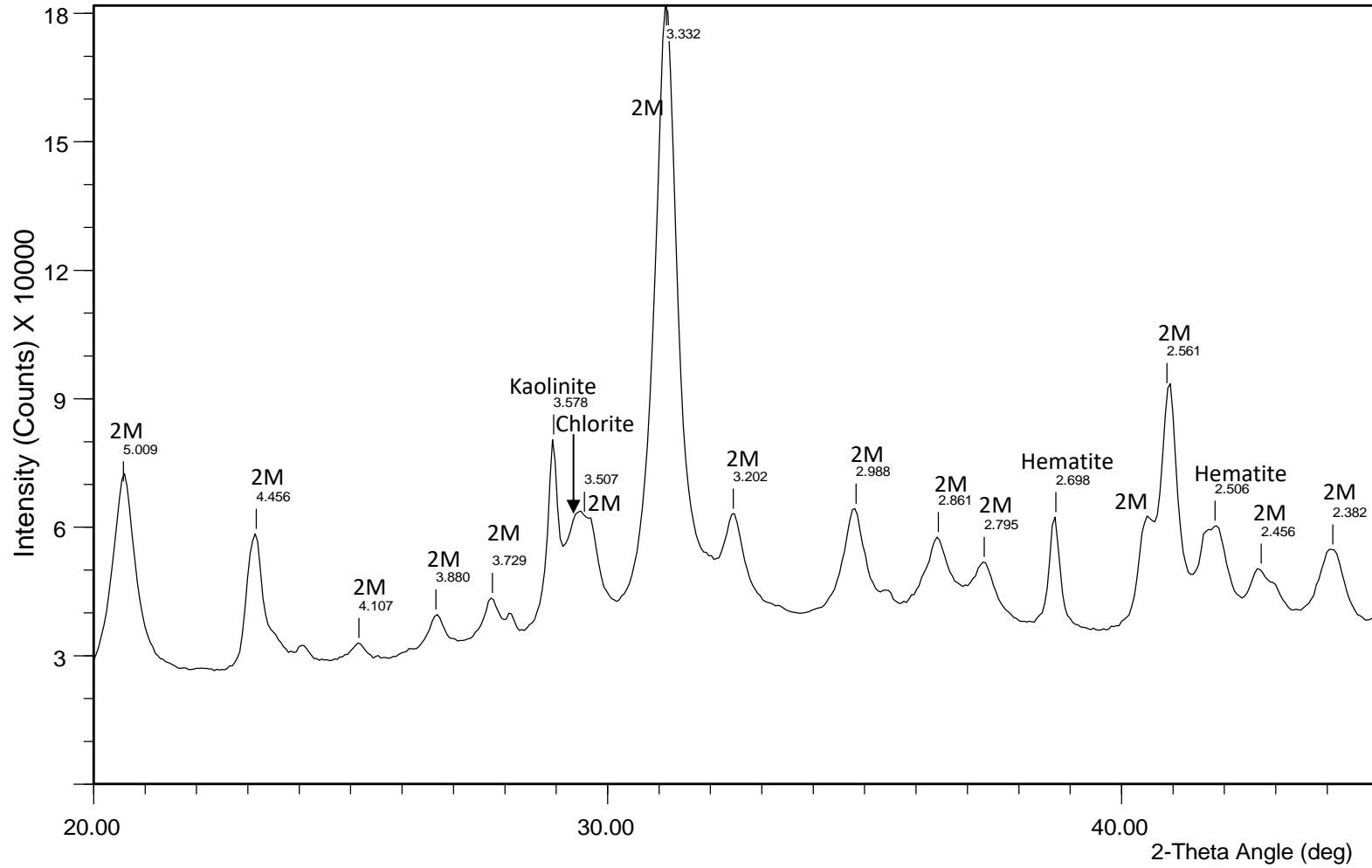
File Name: c:\...milungerabasin\db389.6 2-1 backpack.cpi

Sample ID Dob-441 <2μm



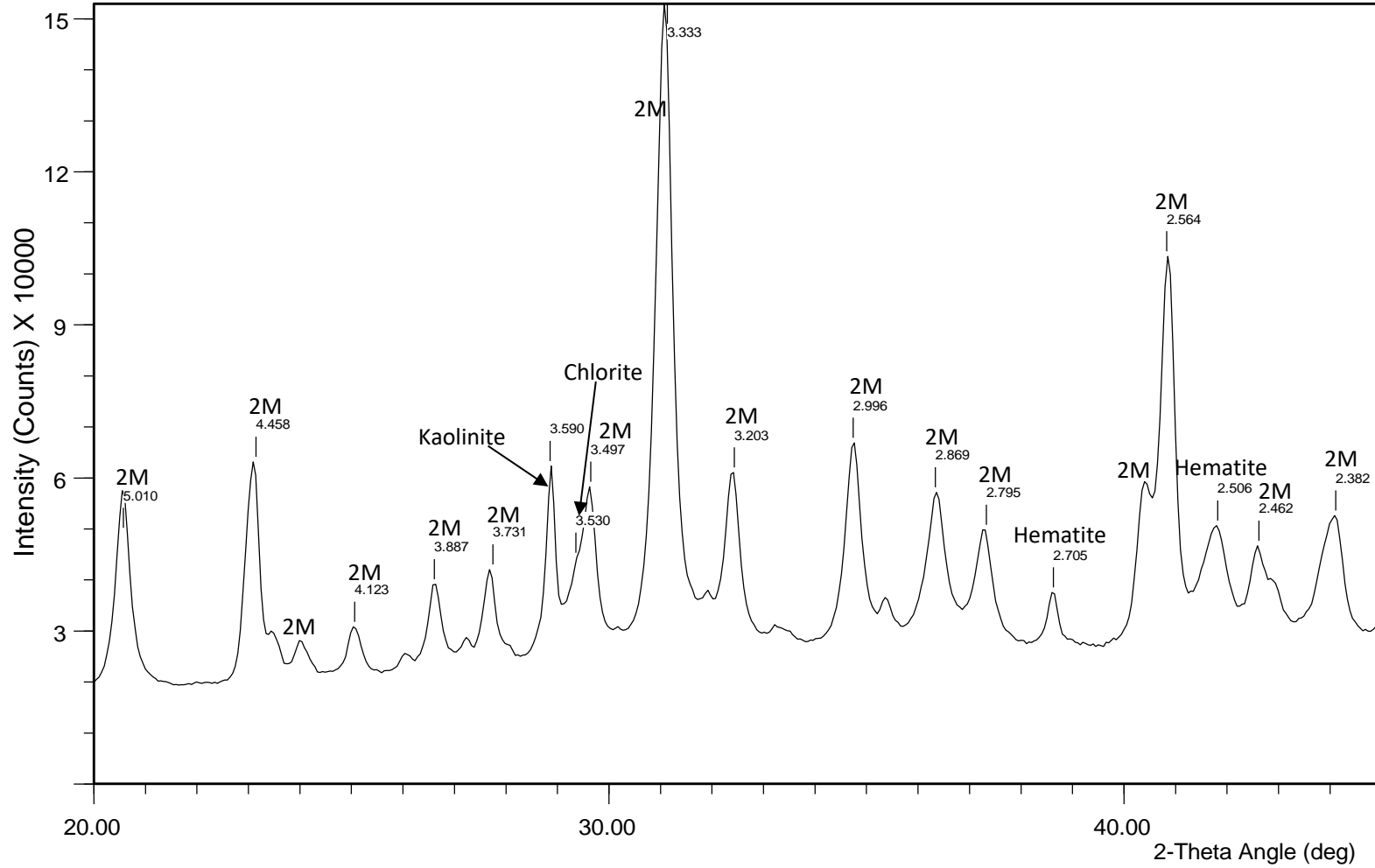
File Name: c:\...\milungerabasin\db441backpack-2.cpi

Sample ID Dob-441 <1 μ m



File Name: c:\...\milungerabasin\db441-1 backpack.cpi

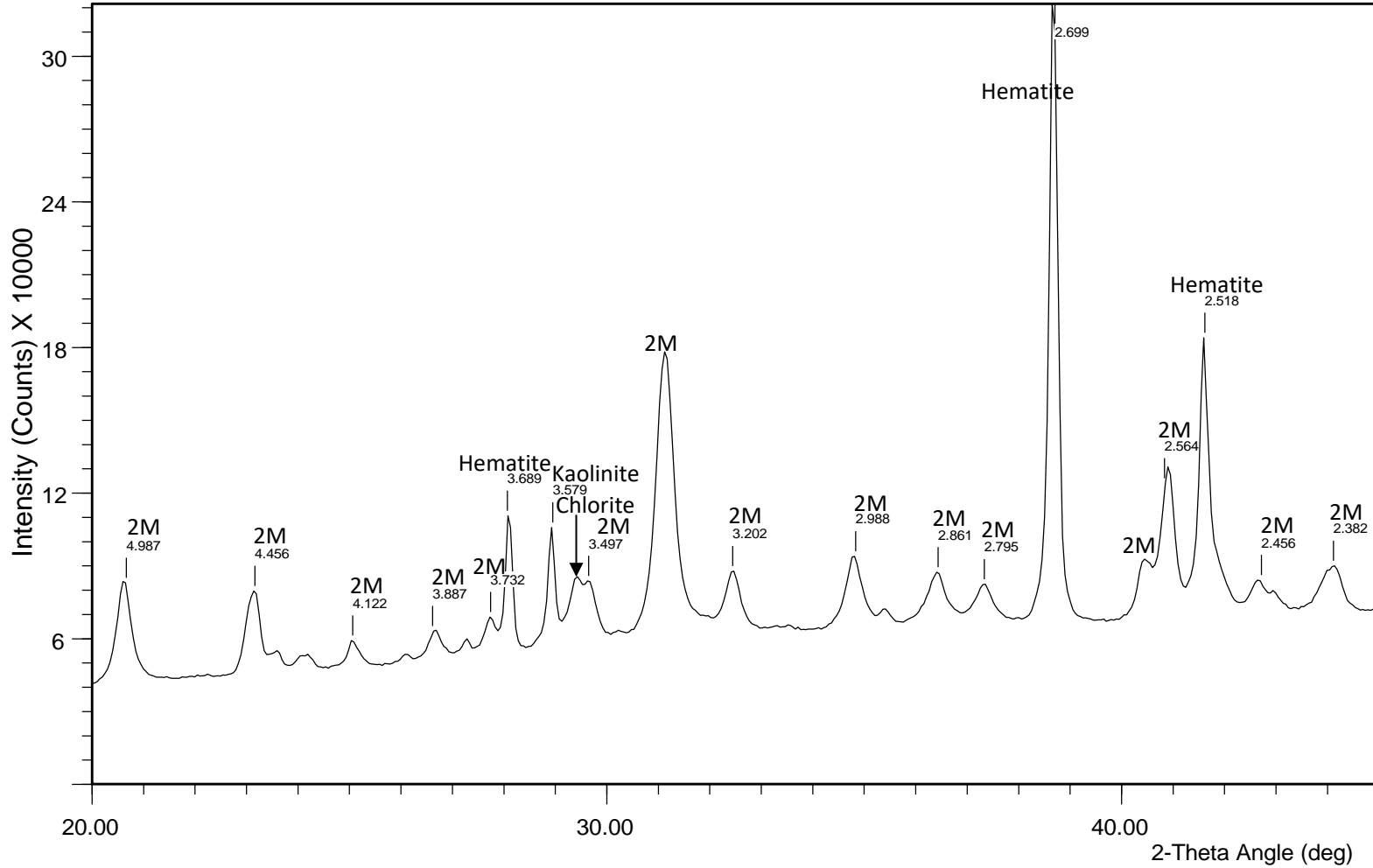
Sample ID Dob-449.1 <2μm



File Name: c:\...\milungerabasin\db449.1-2 backpack.cpi

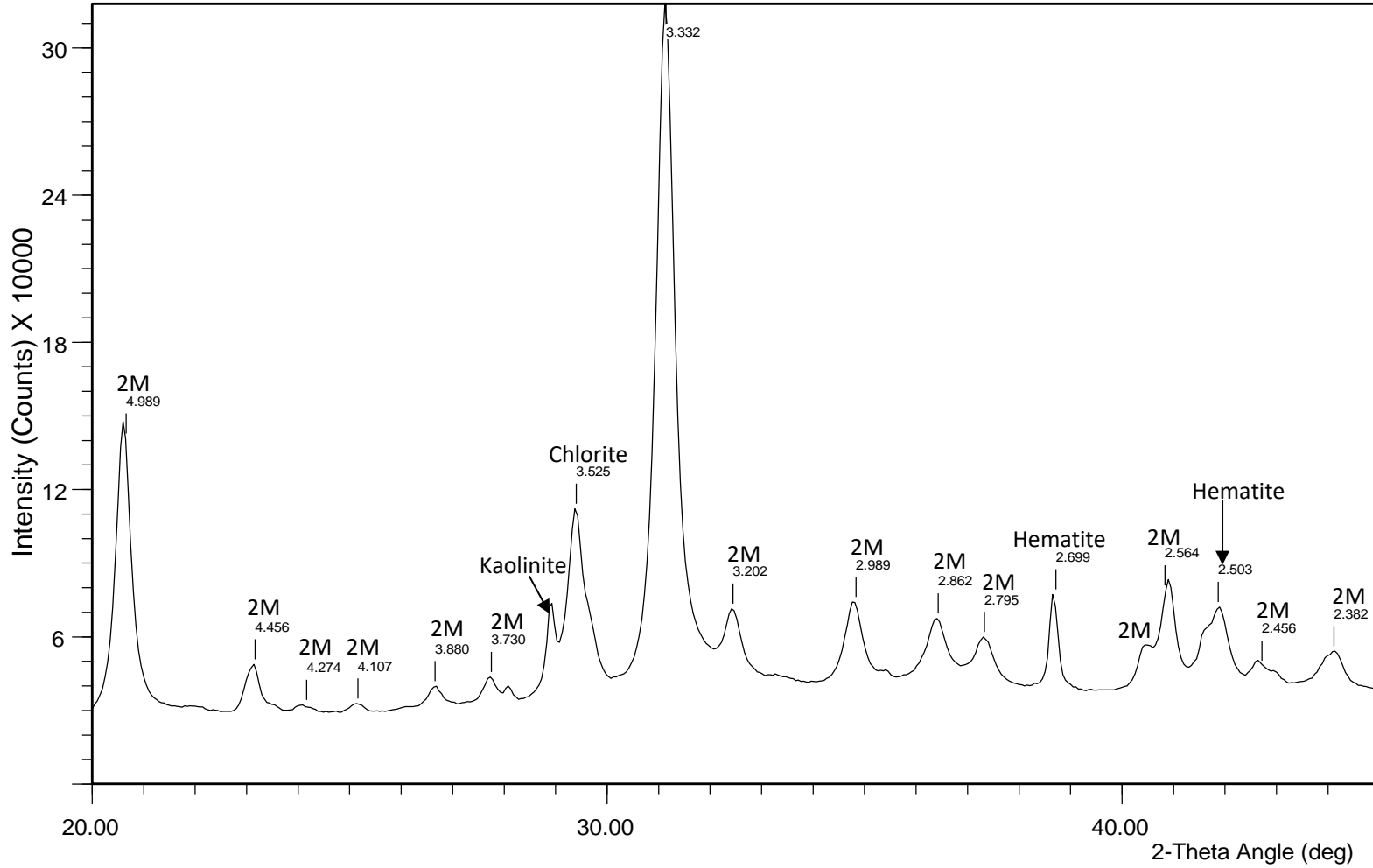
Dob-476.6 <2μm

Sample ID



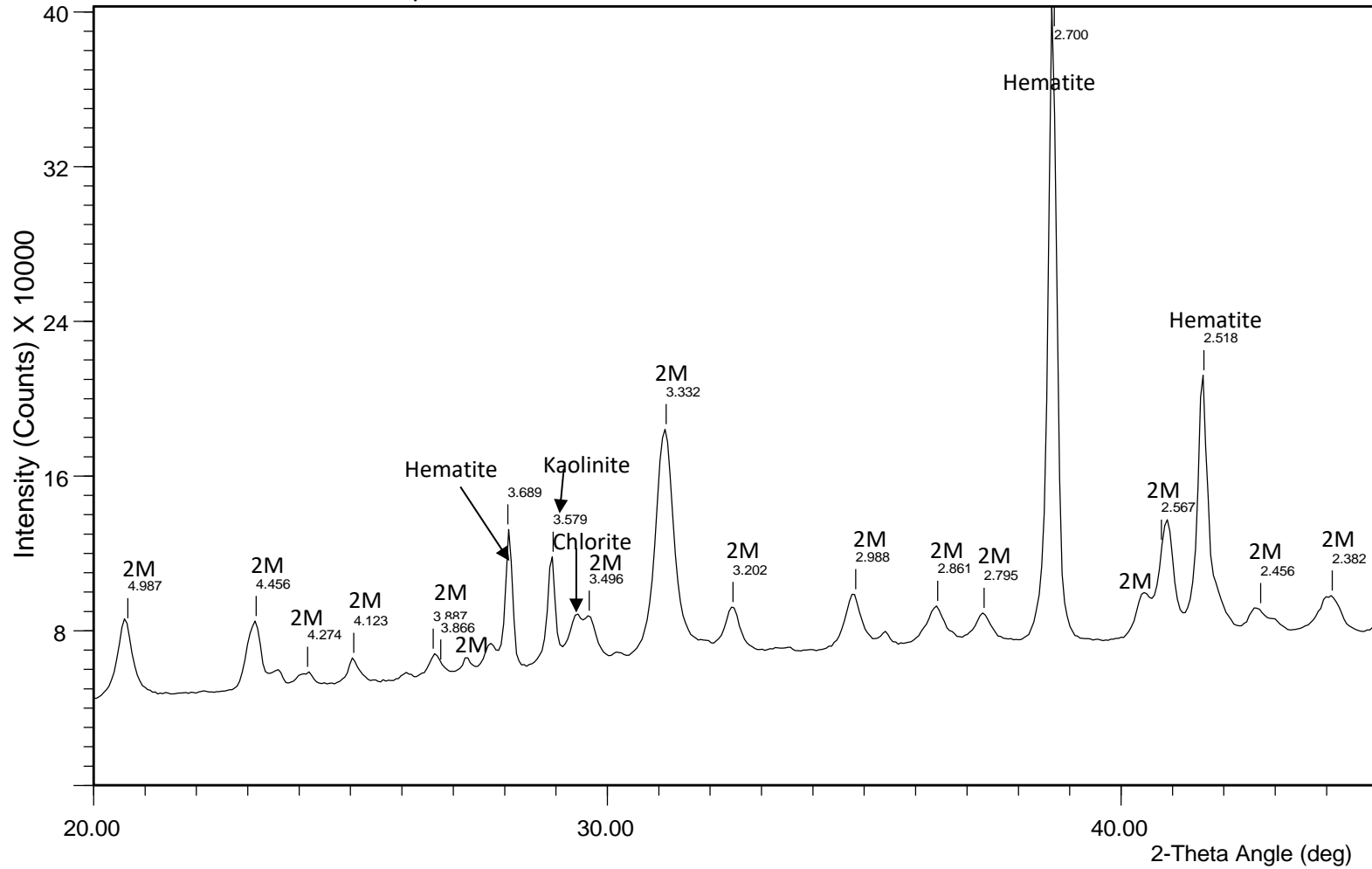
File Name: c:\...\milungerabasin\db476 backpack-2.cpi

Sample ID Dob-476.6 <1 μ m



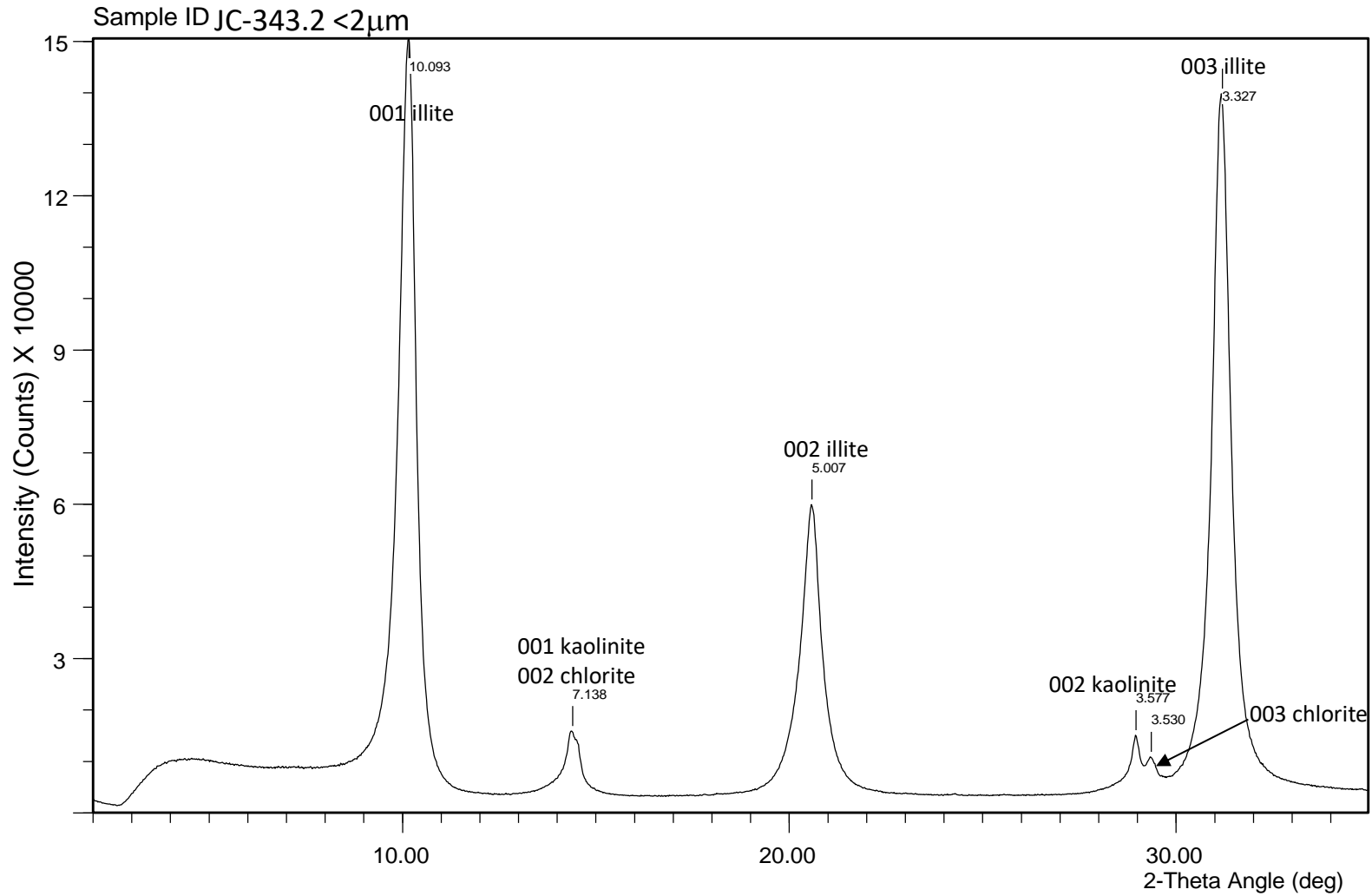
File Name: c:\...\milungerabasin\db476-1 backpack.cpi

Sample ID Dob-476.6 2-1 μ m



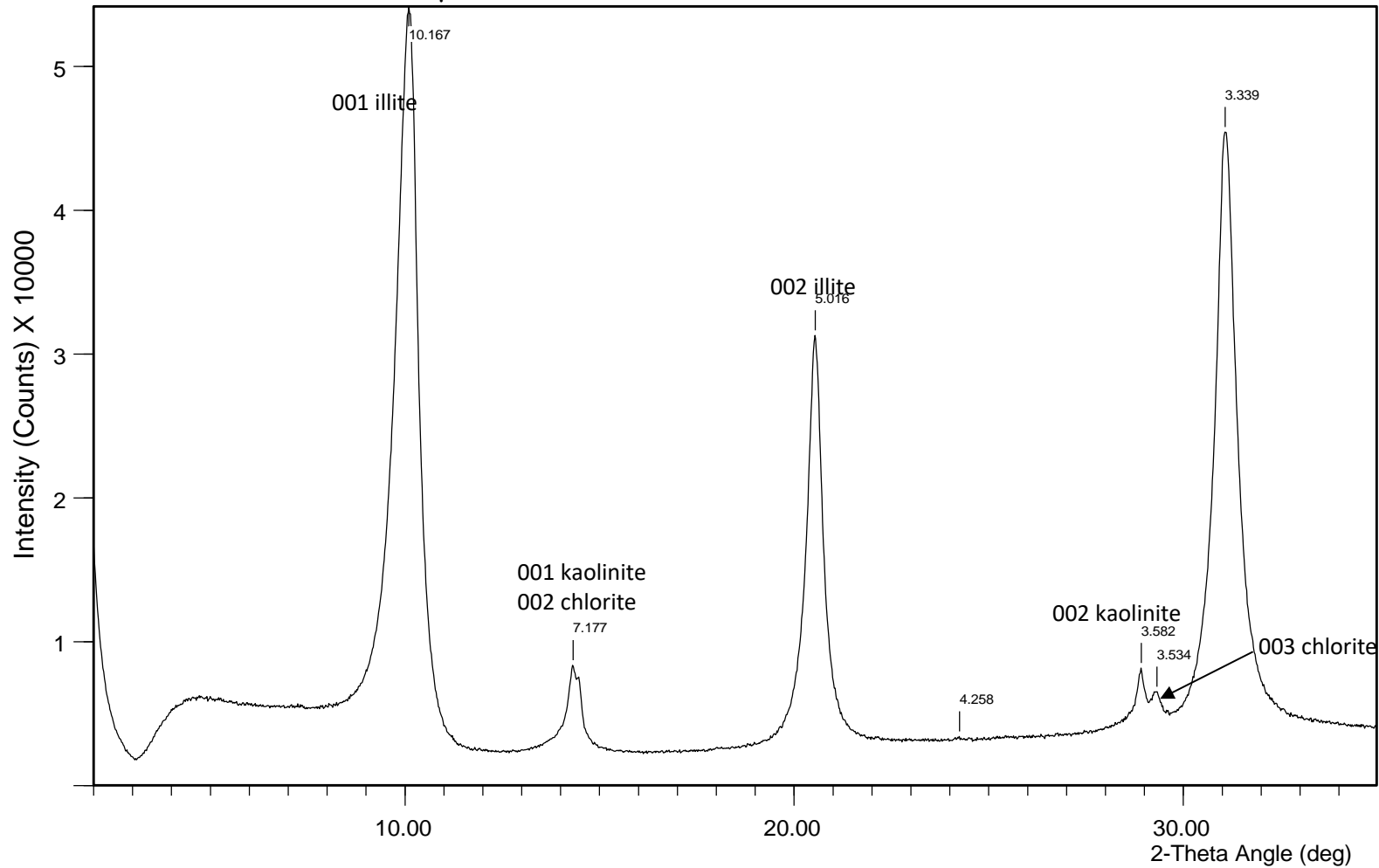
File Name: c:\...\milungerabasin\db476 2-1 backpack.cpi

XRD PATTERN FOR ORIENTED CLAY FRACTIONS



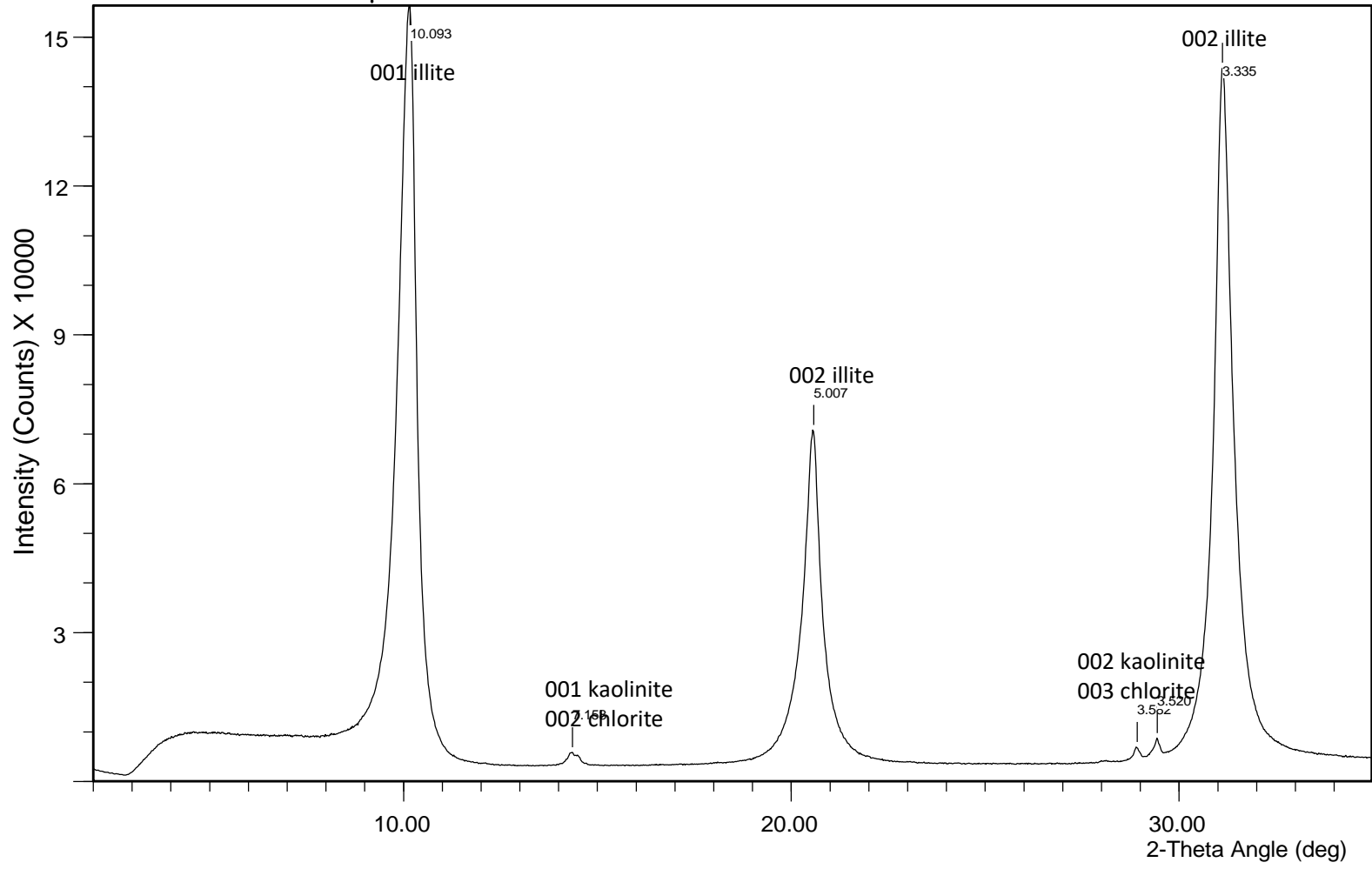
File Name: c:\...tonguc-clays\milungerabasin\jc343.2ad-2.cpi

Sample ID JC-343.2 0.5-0.1 μ m



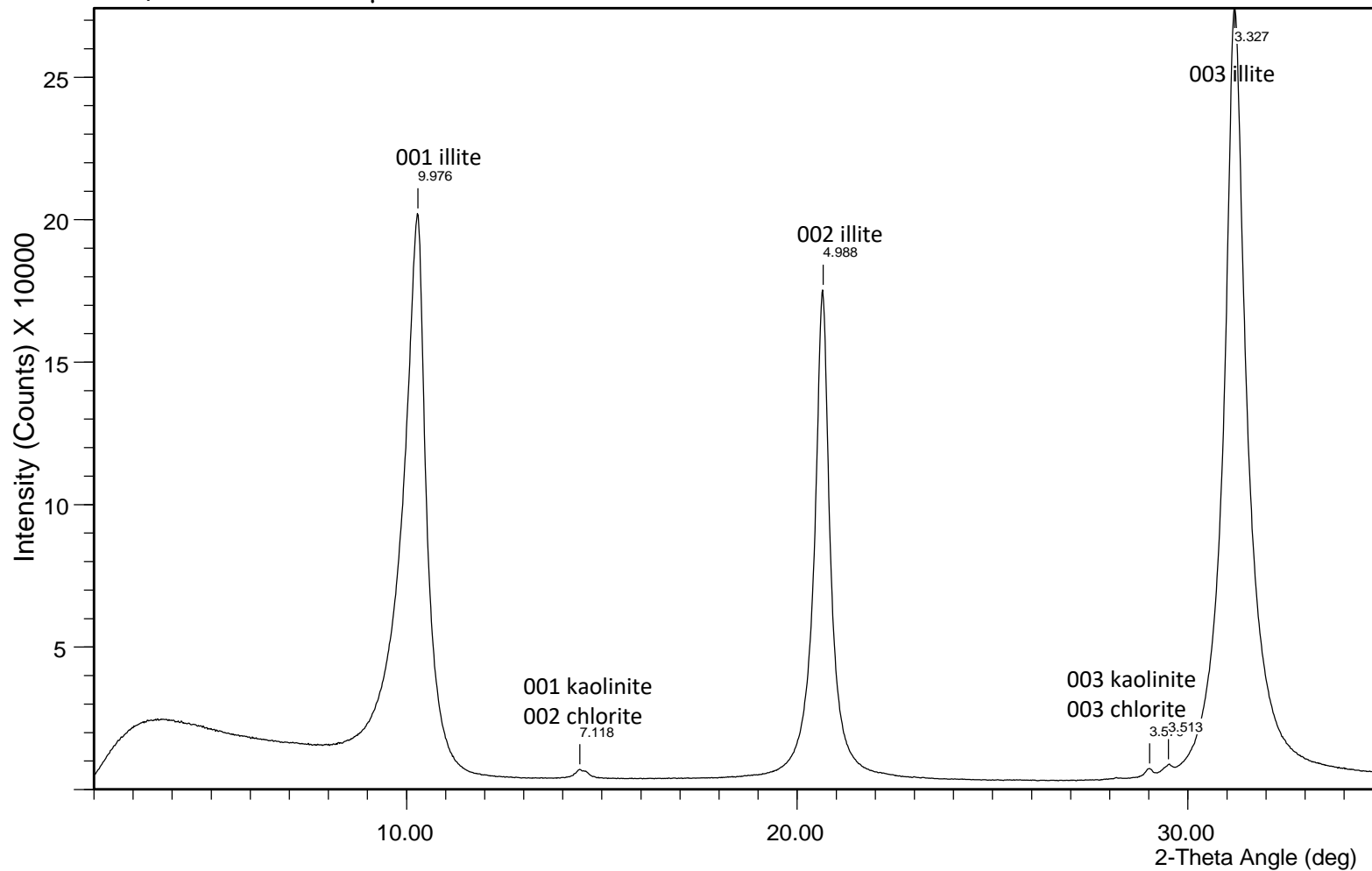
File Name: c:\...\milungerabasin\jc343.2_1-0.5.cpi

Sample ID JC-360.7 <2 μ m



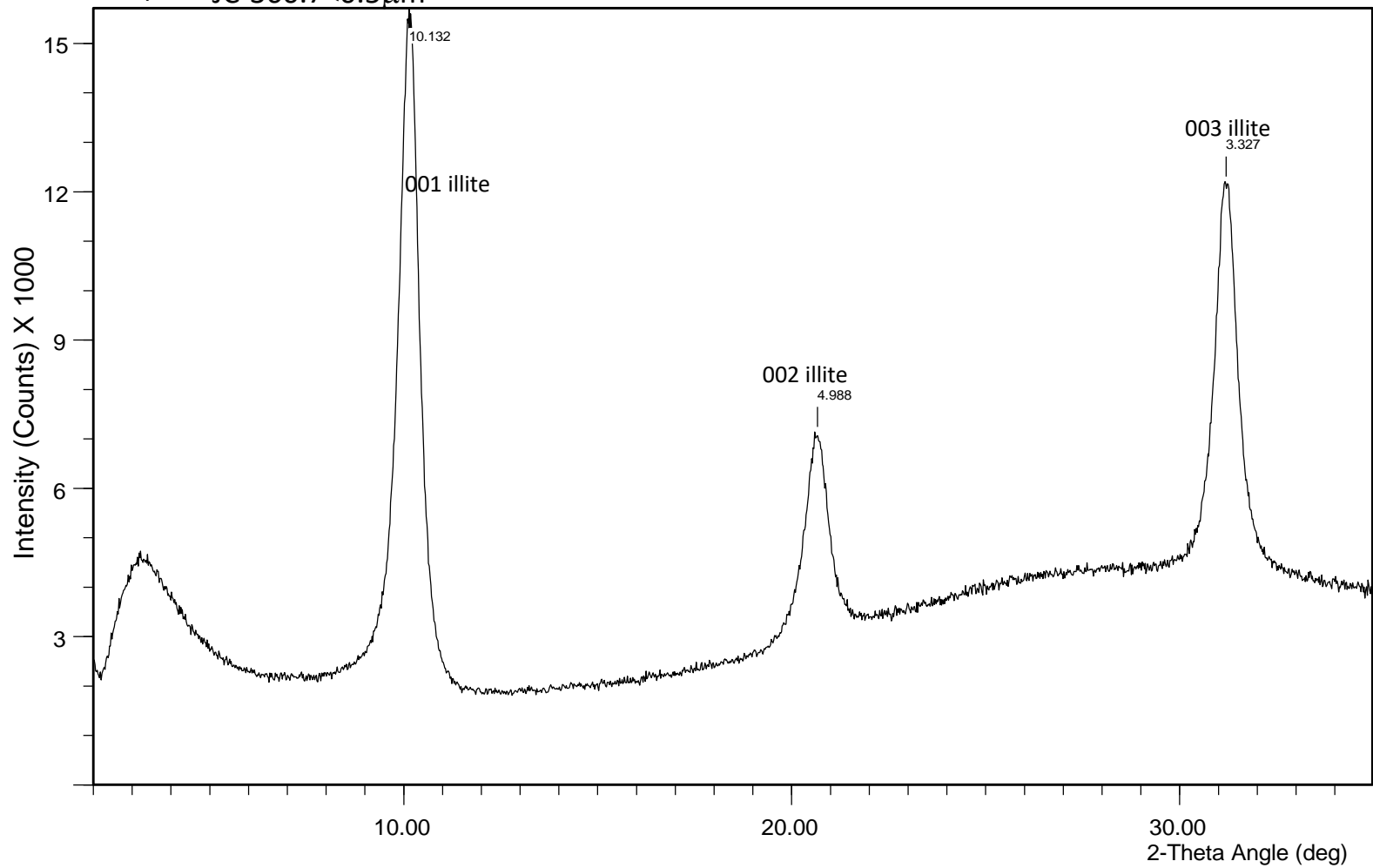
File Name: c:\...tonguc-clays\milungerabasin\jc360.7-2ad.cpi

Sample ID JC-360.7 <1 μ m



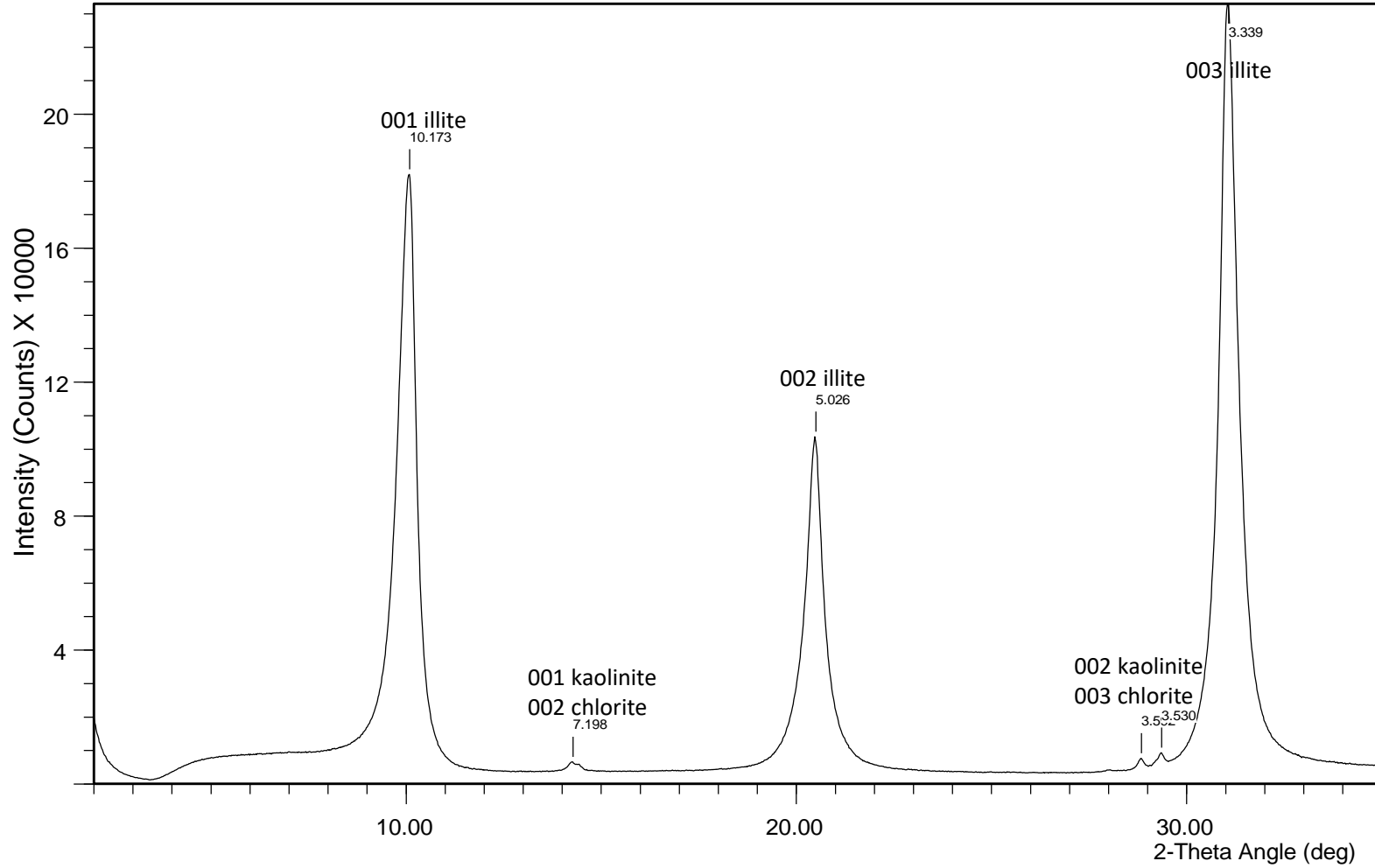
File Name: c:\data\tonguc-clays\milungerabasin\jc360-1.cpi

Sample ID JC-360.7<0.5 μ m



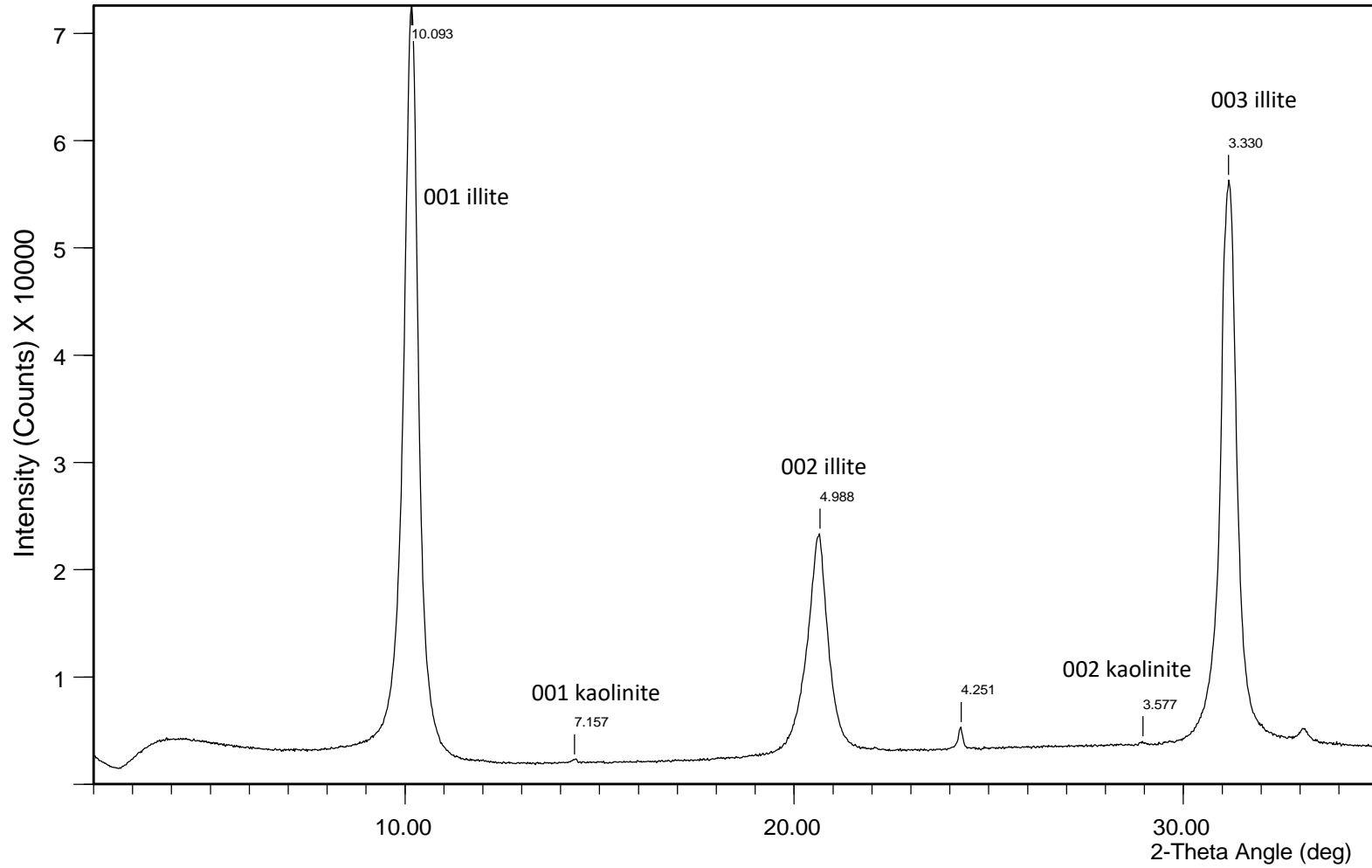
File Name: c:\...\milungerabasin\jc360.7-0.5ad.cpi

Sample ID JC-360.7 2-1 μ m



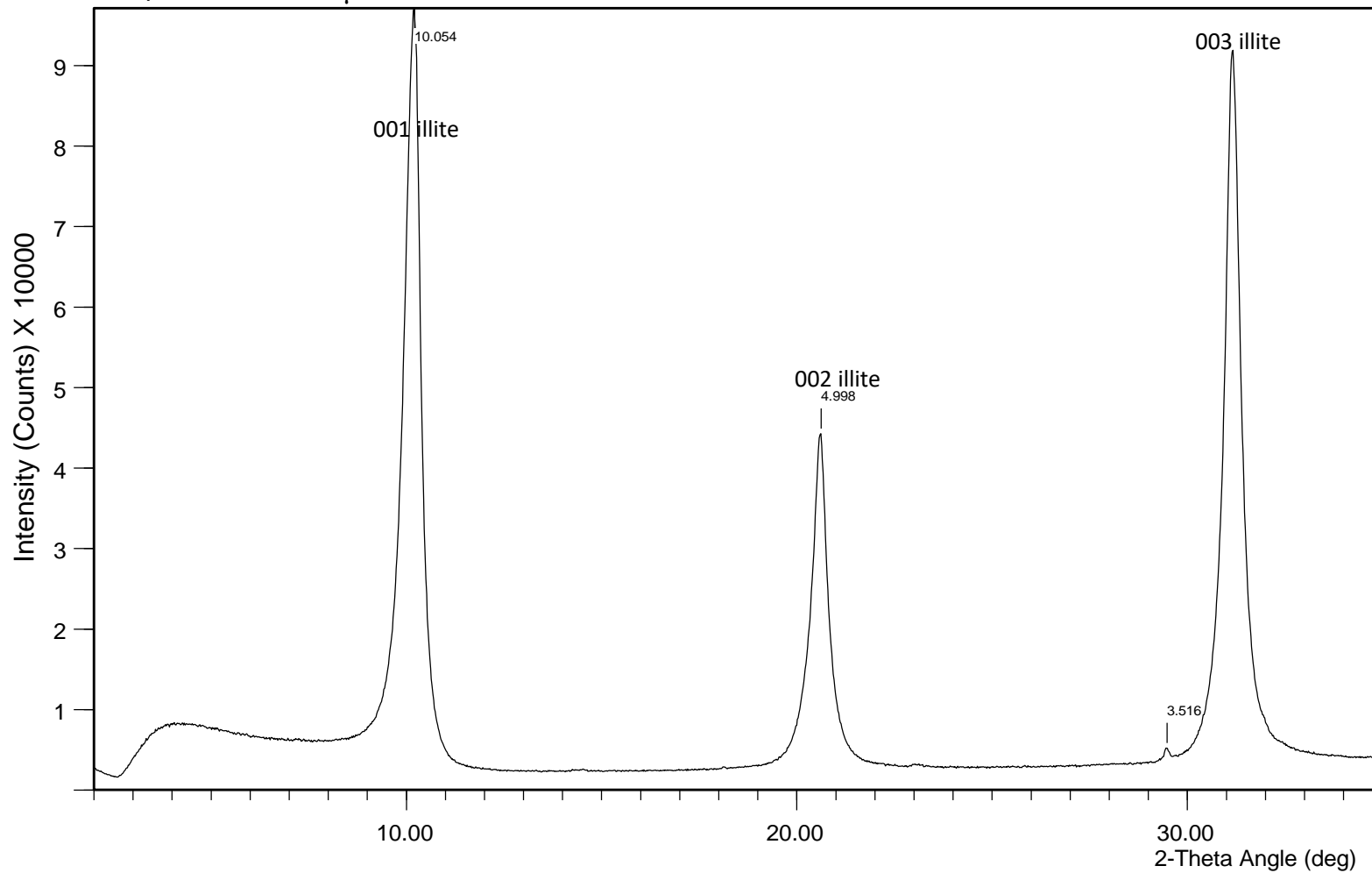
File Name: c:\data\tonguc-clays\milungerabasin\jc360ad2-1.cpi

Sample ID JC-360.6<2μm – host rock



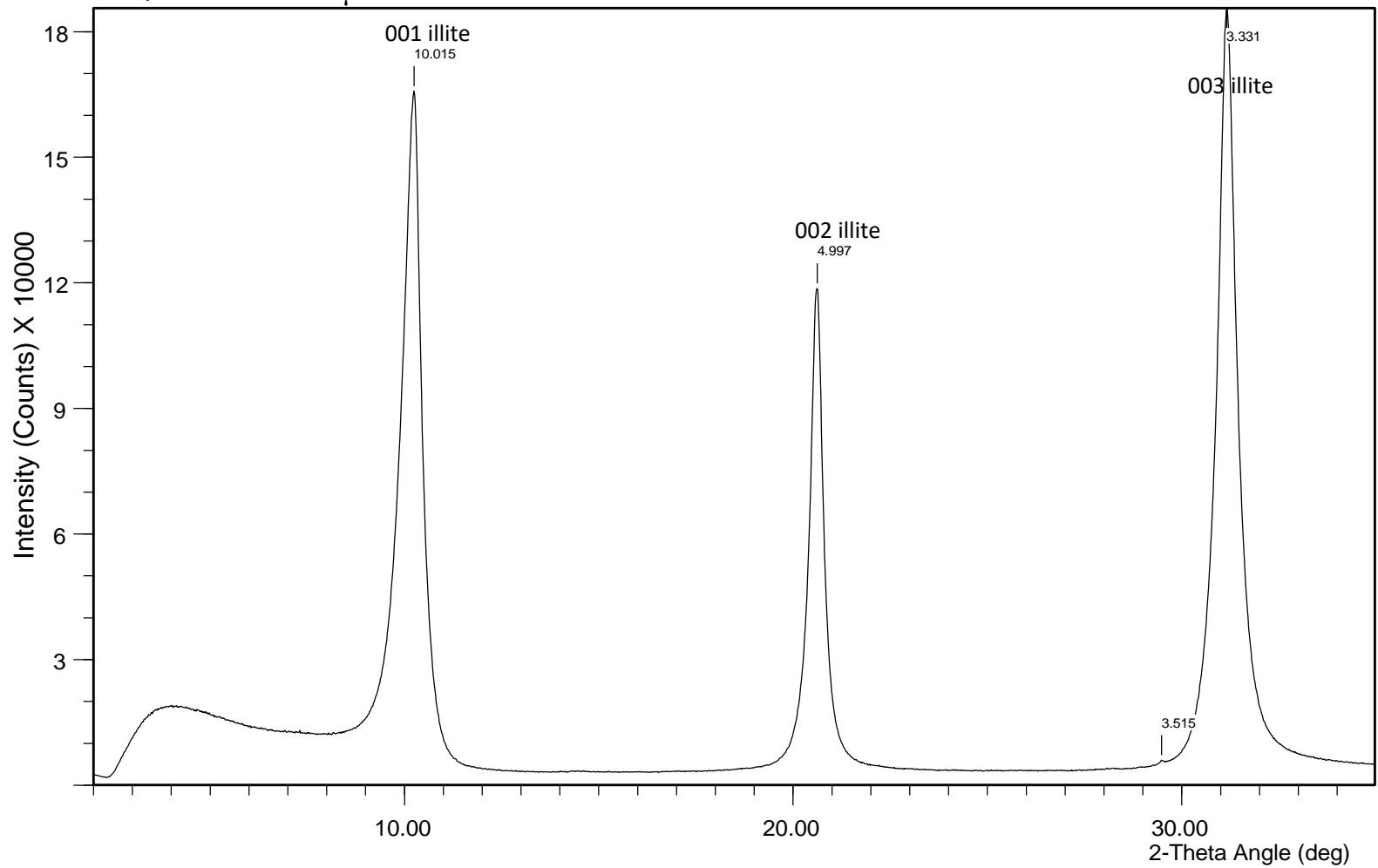
File Name: c:\...tonguc-clays\milungerabasin\jc360.6-2ad.cpi

Sample IDJC-408 <2μm



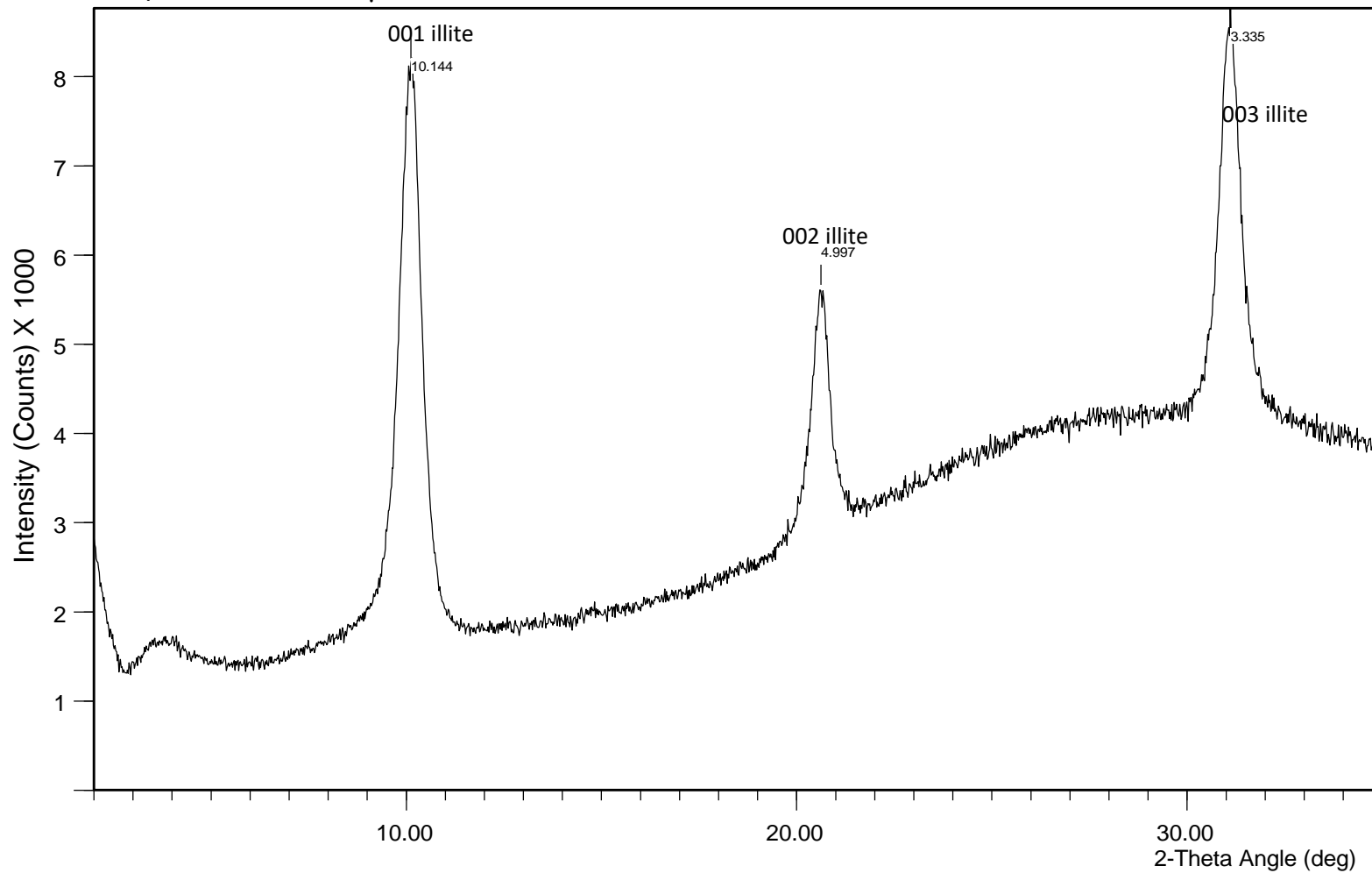
File Name: c:\data\tonguc-clays\milungerabasin\jc408-2ad.cpi

Sample ID JC-408 <1 μ m



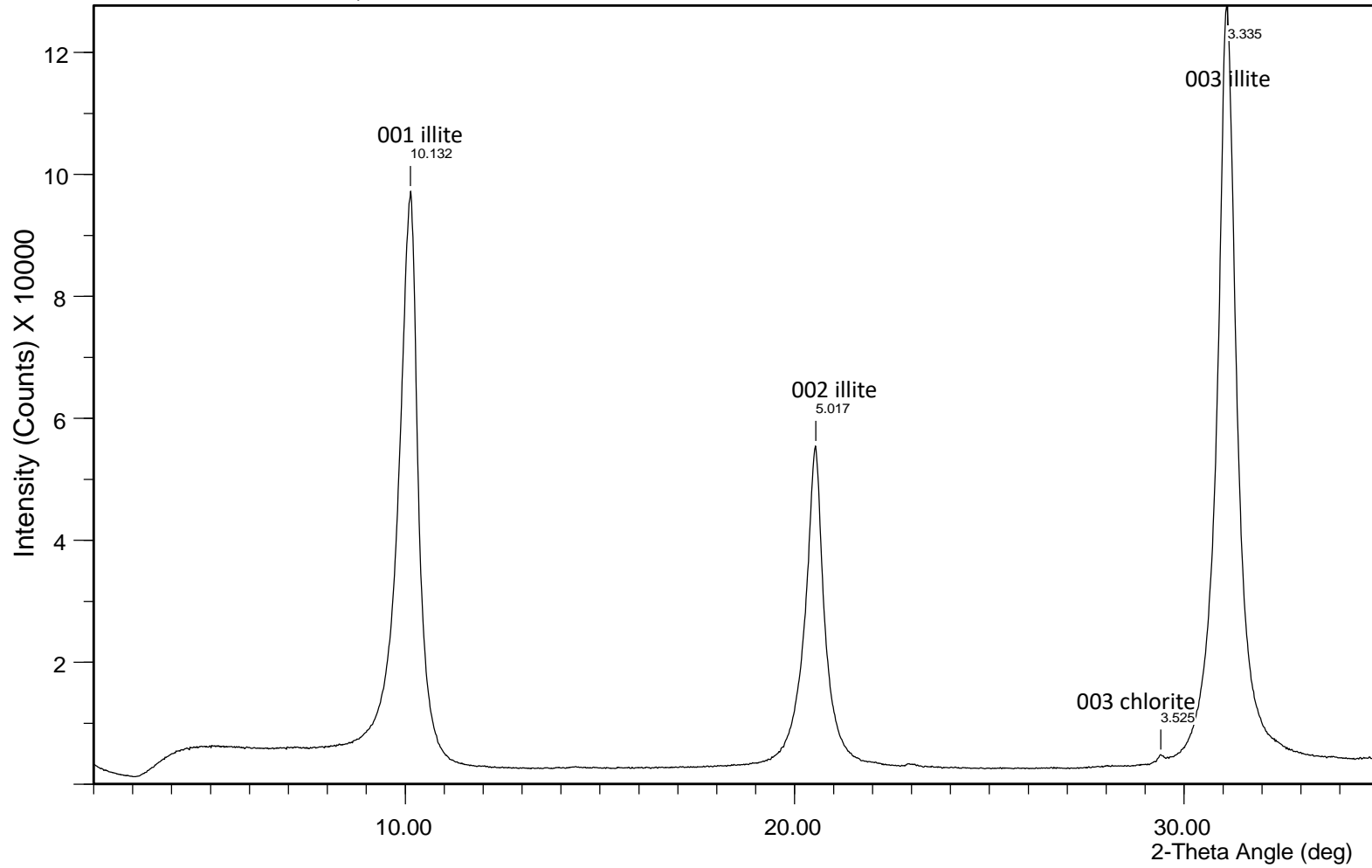
File Name: c:\data\tonguc-clays\milungerabasin\jc408-1.cpi

Sample IDJC-408 <0.5 μ m



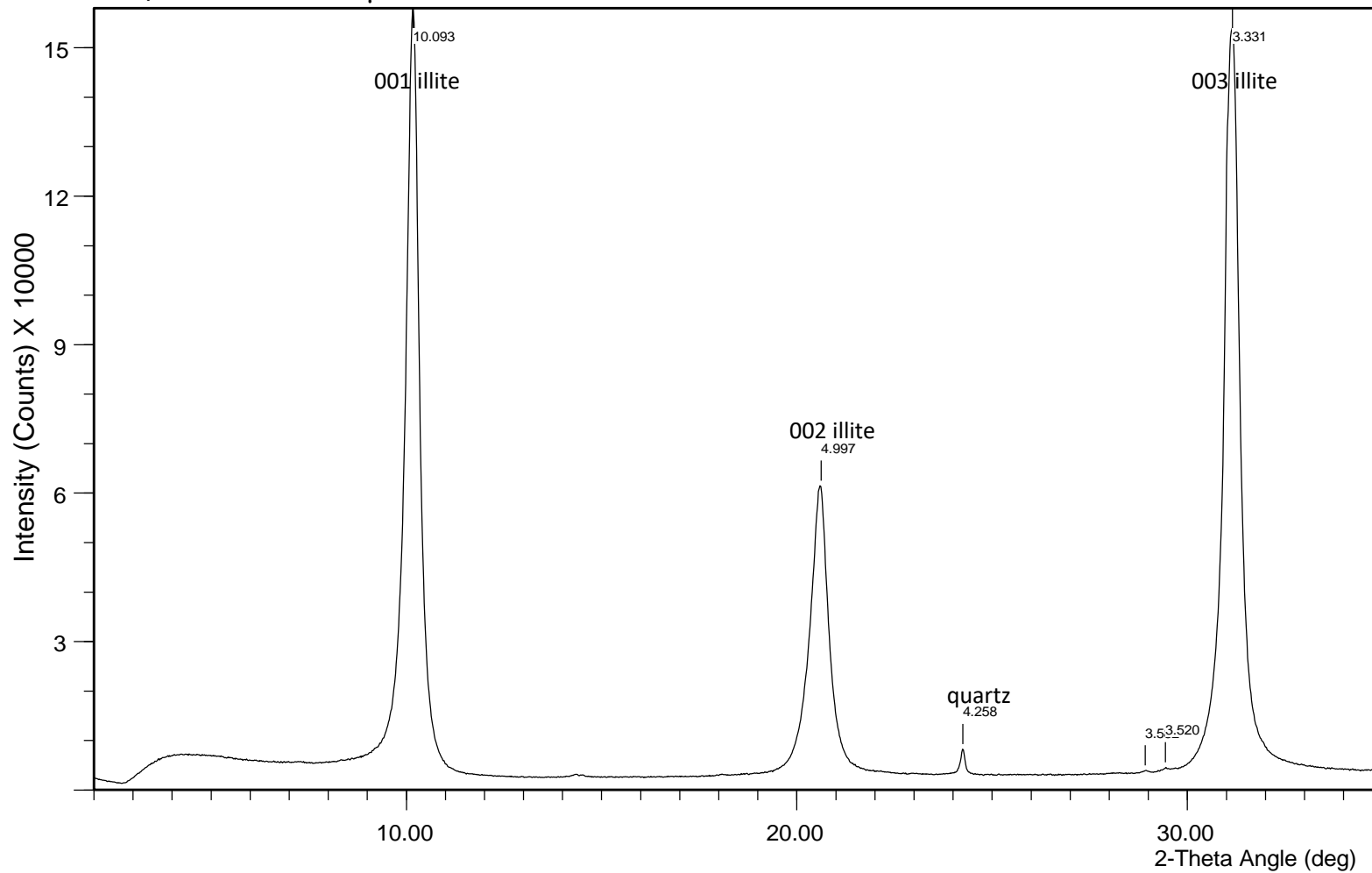
File Name: c:\...\tonguc-clays\milungerabasin\jc408-0.5ad.cpi

Sample ID JC-408 2-1 μ m



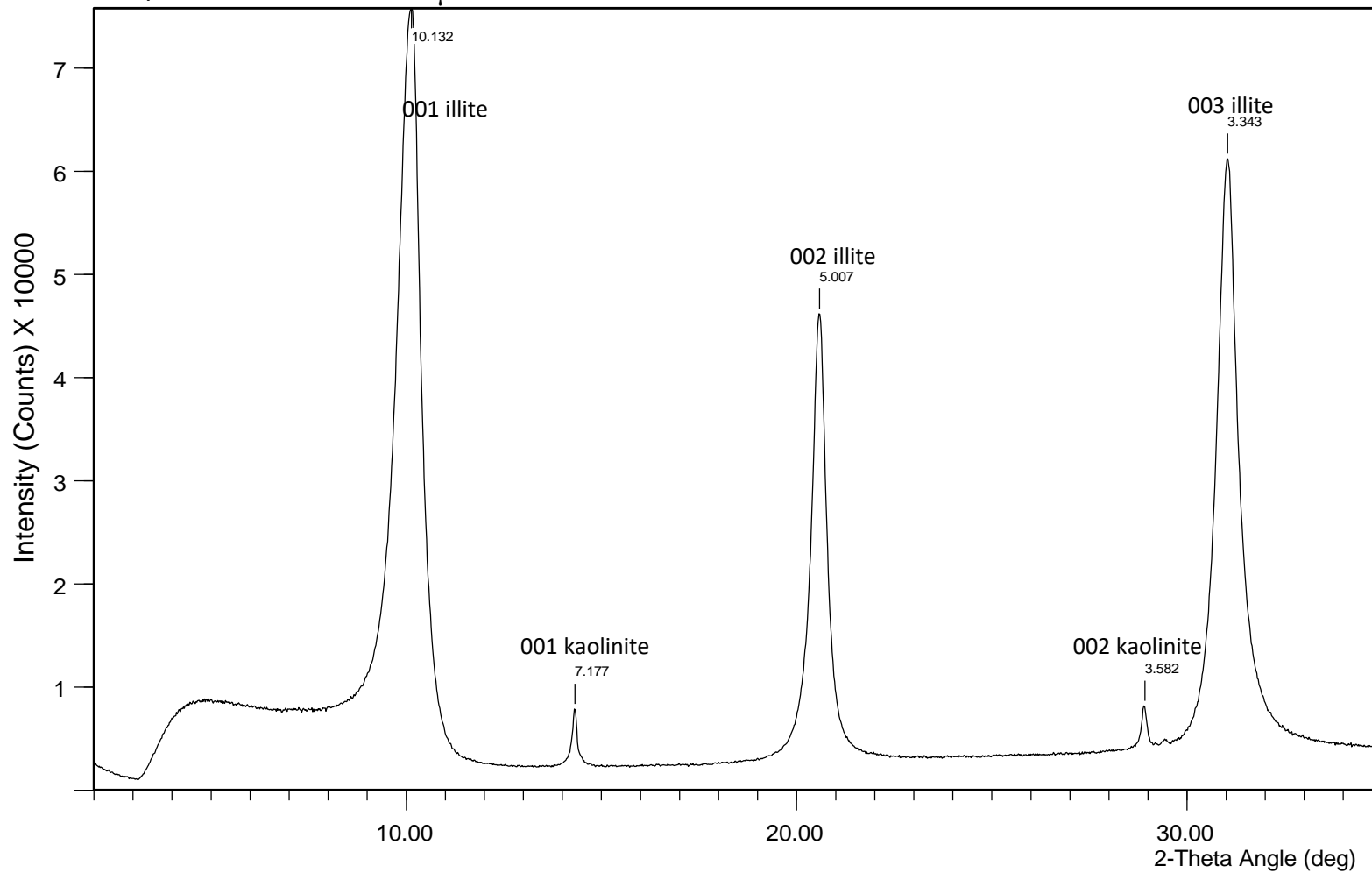
File Name: c:\data\tonguc-clays\milungerabasin\jc408ad2-1.cpi

Sample IDJC-440.5 <2 μ m



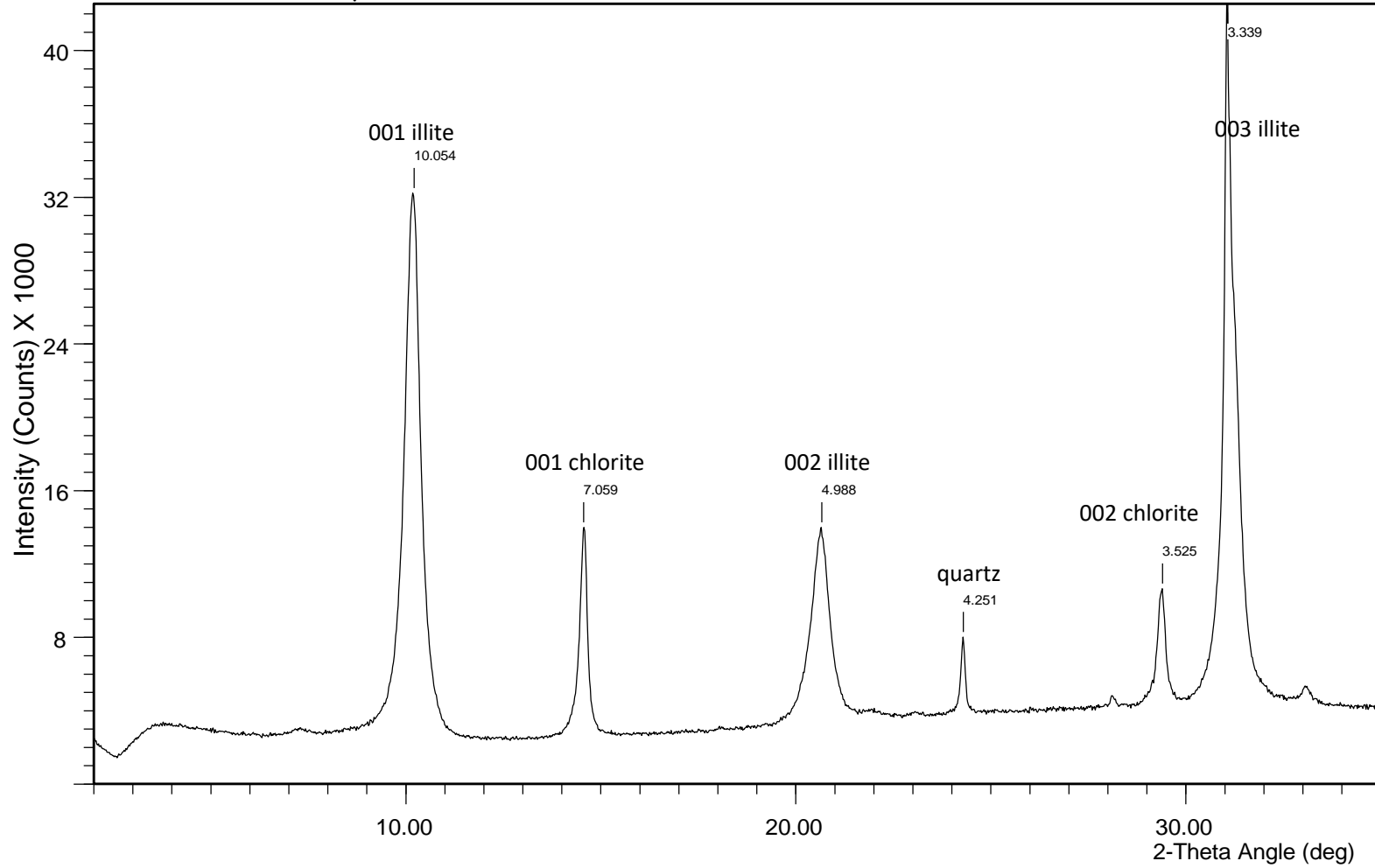
File Name: c:\...\milungerabasin\jic440.5ad-2.cpi

Sample ID JC-440.5 0.5-0.1 μ m



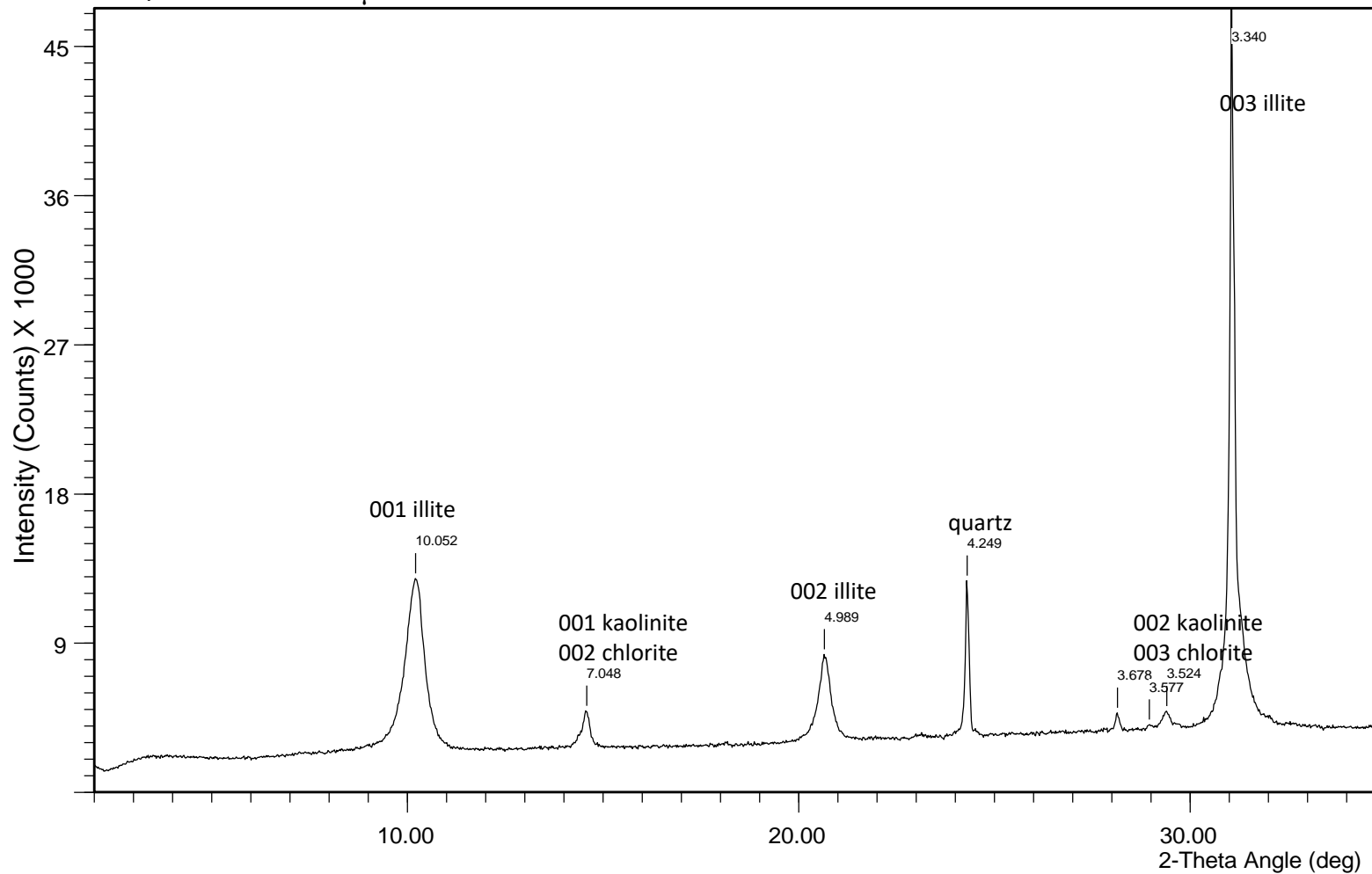
File Name: c:\...\milungerabasin\jc440.5 0.5-0.15ad.cpi

Sample ID JC-500 <2 μ m – host rock



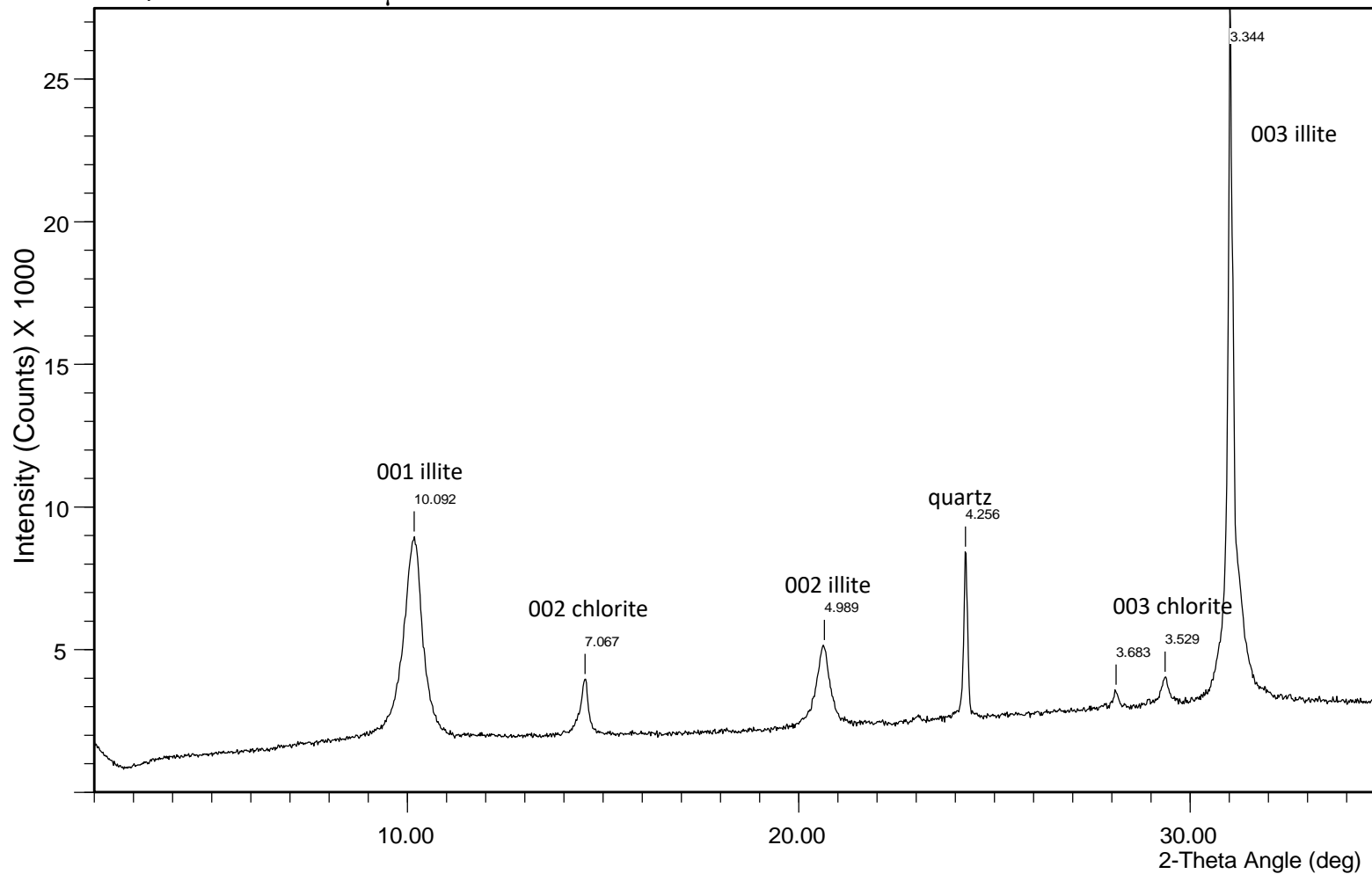
File Name: c:\data\tonguc-clays\milungerabasin\jc500-2ad.cpi

Sample ID JC-500 2-1 μ m – host rock



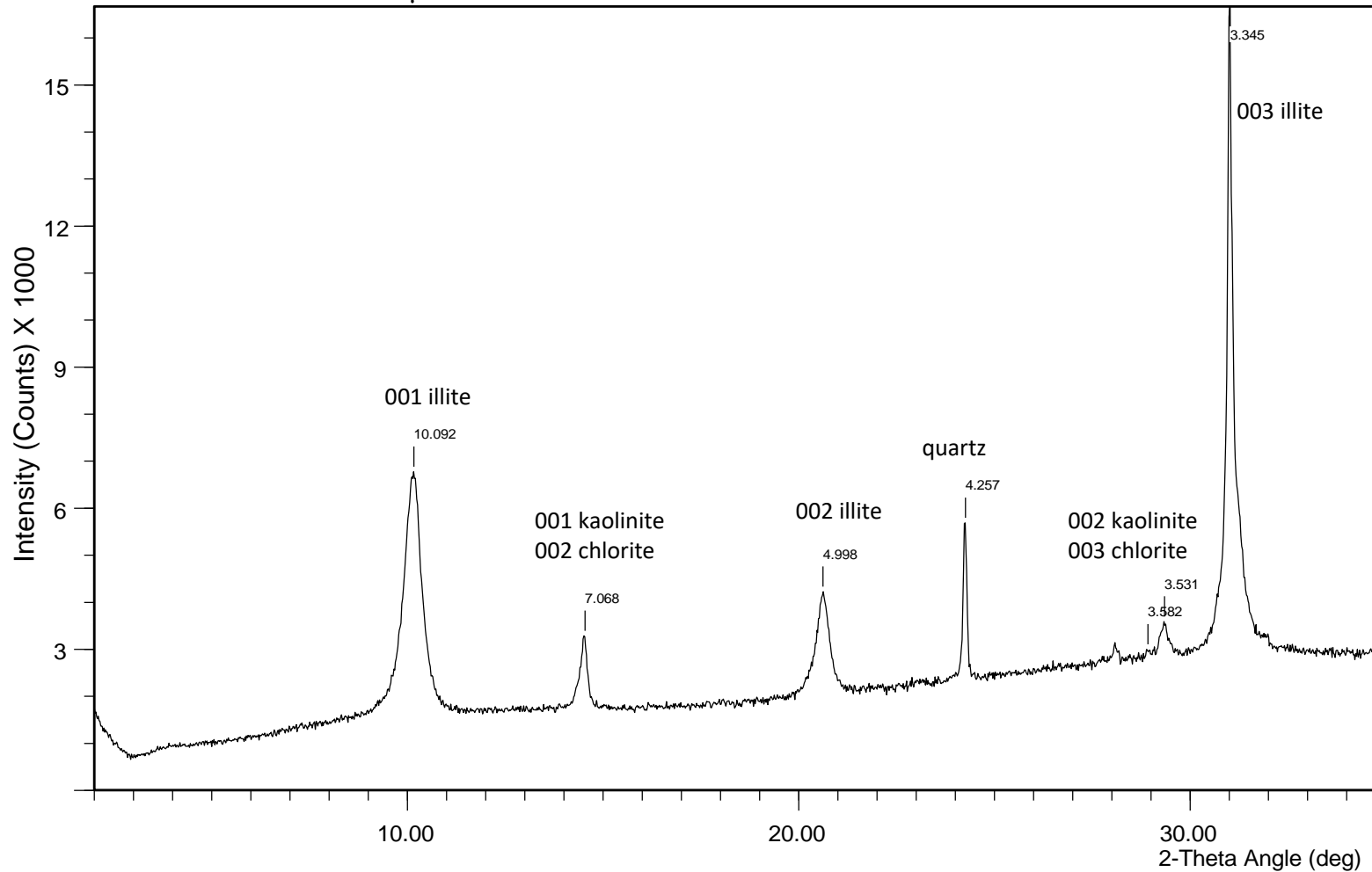
File Name: c:\...tonguc-clays\milungerabasin\jc500 2-1ad.cpi

Sample ID JC-500 1-0.5 μ m – host rock



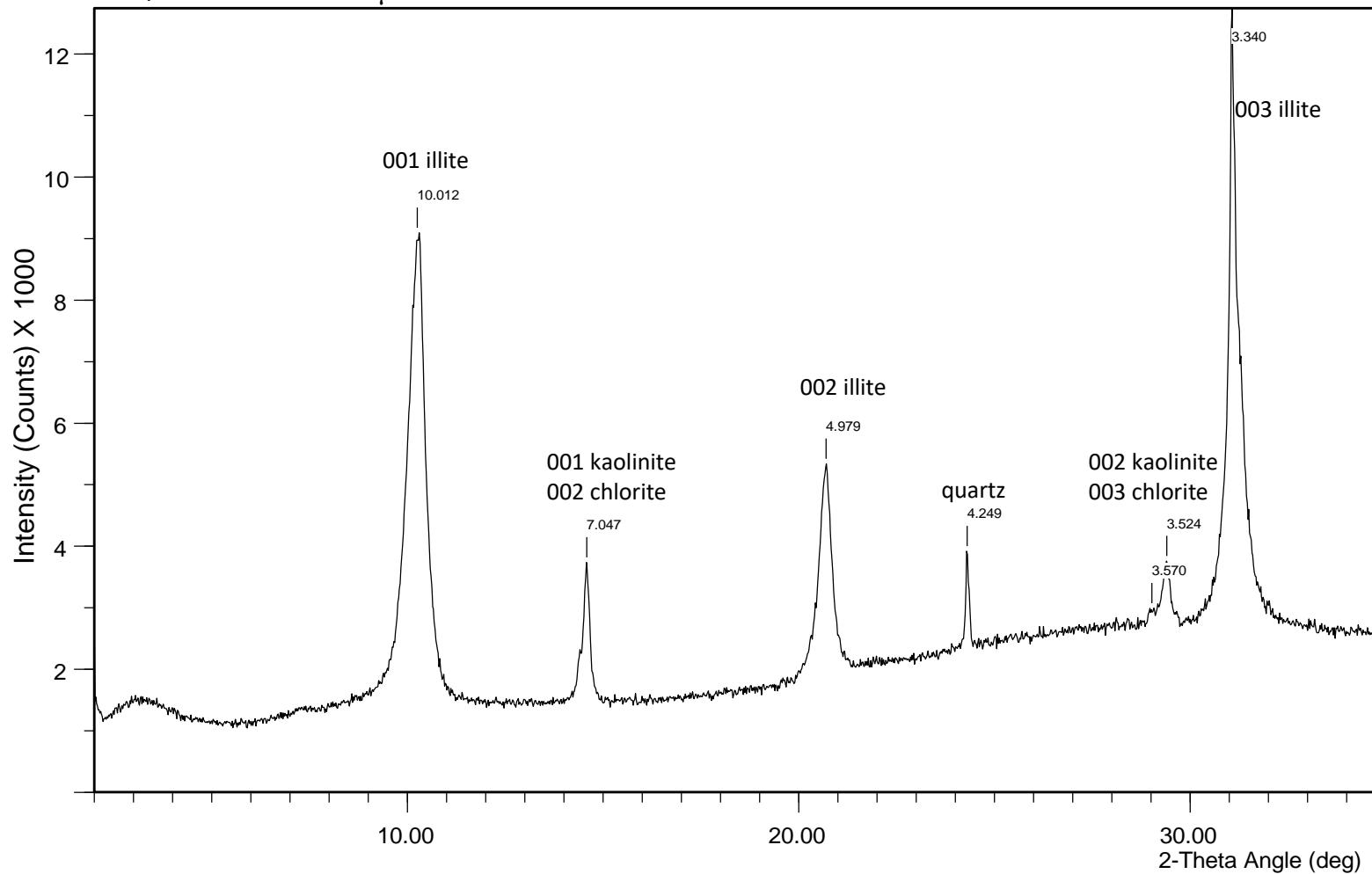
File Name: c:\...\milungerabasin\jc500 1-0.5ad.cpi

Sample ID JC-500 0.5-0.2 μ m – host



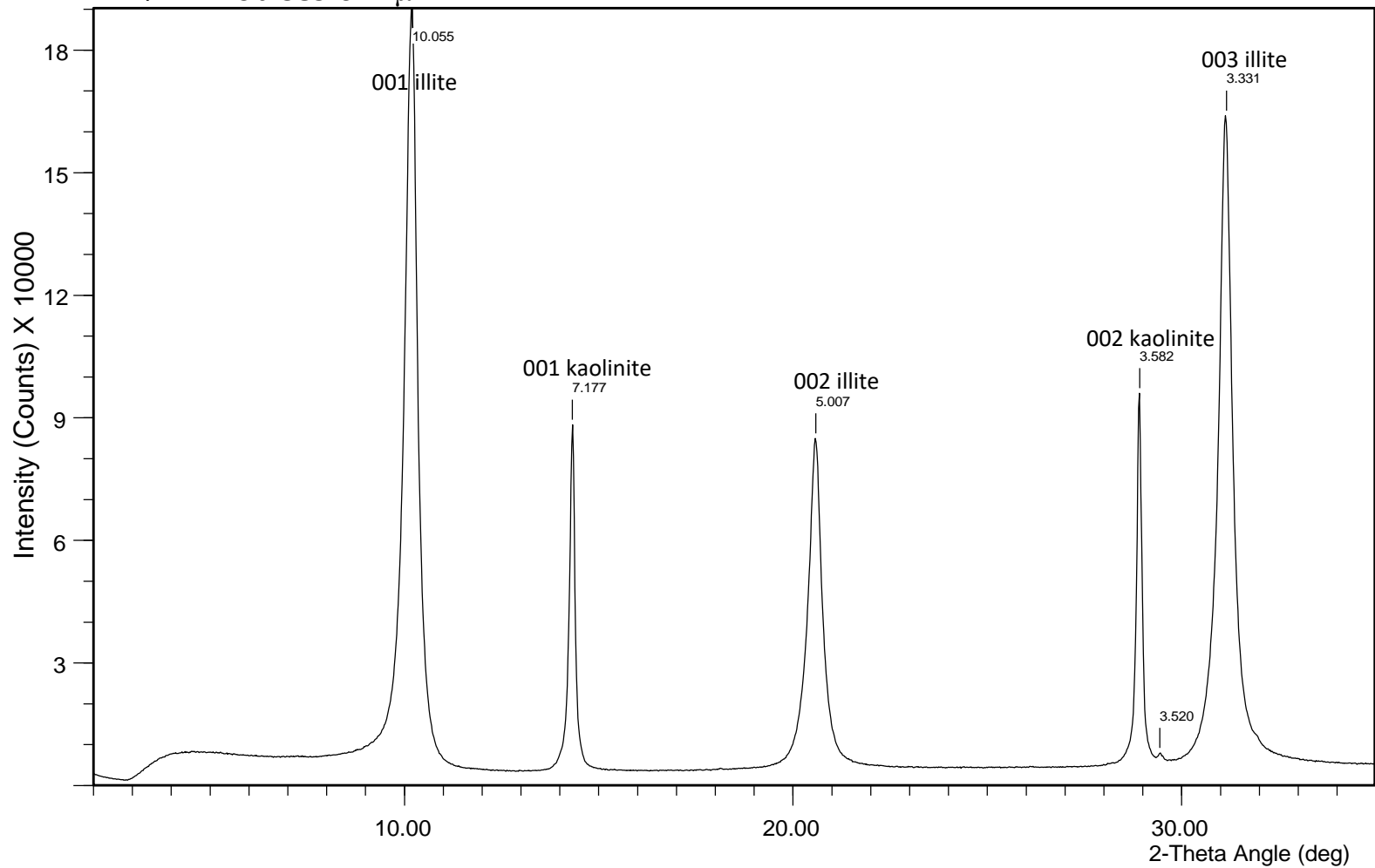
File Name: c:\...\milungerabasin\jc500 0.5-0.2ad.cpi

Sample ID JC-500 <0.2 μ m – host rock



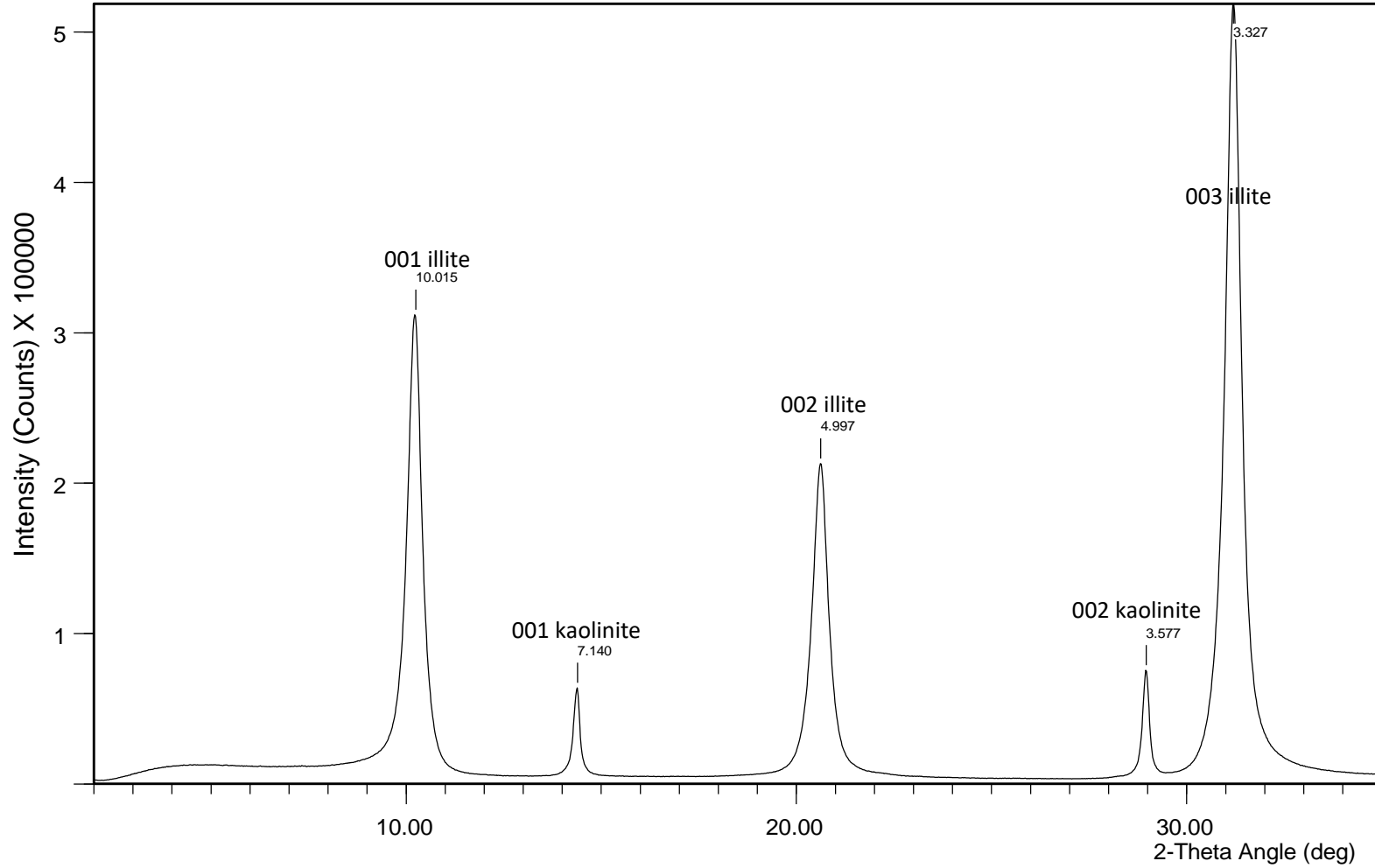
File Name: c:\...tonguc-clays\milungerabasin\jc500-0.2ad.cpi

Sample ID Dob-389.6 <2 μ m



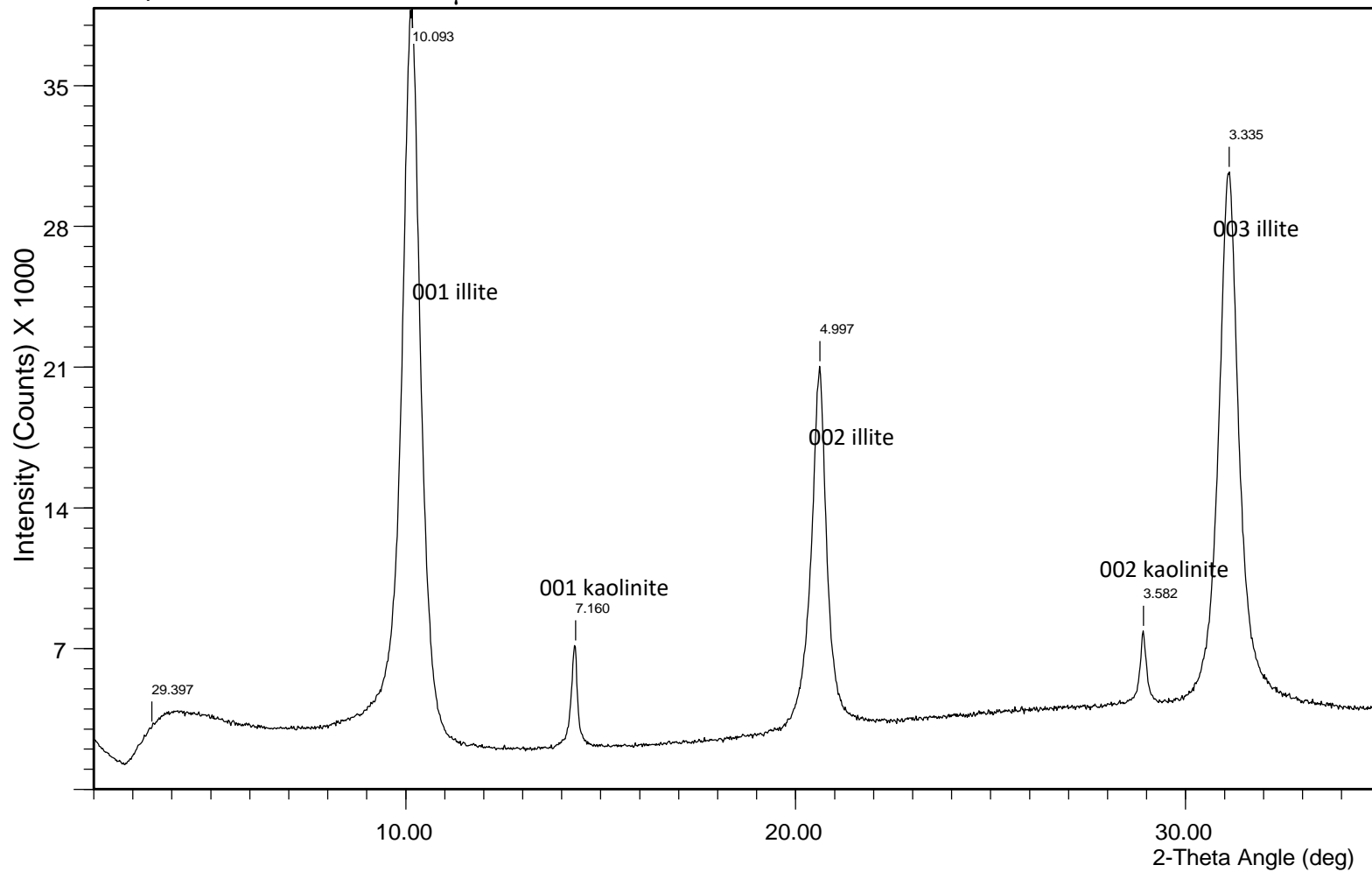
File Name: c:\data\tonguc-clays\milungerabasin\db389-2ad.cpi

Sample ID Dob-389.6 <1 μ m



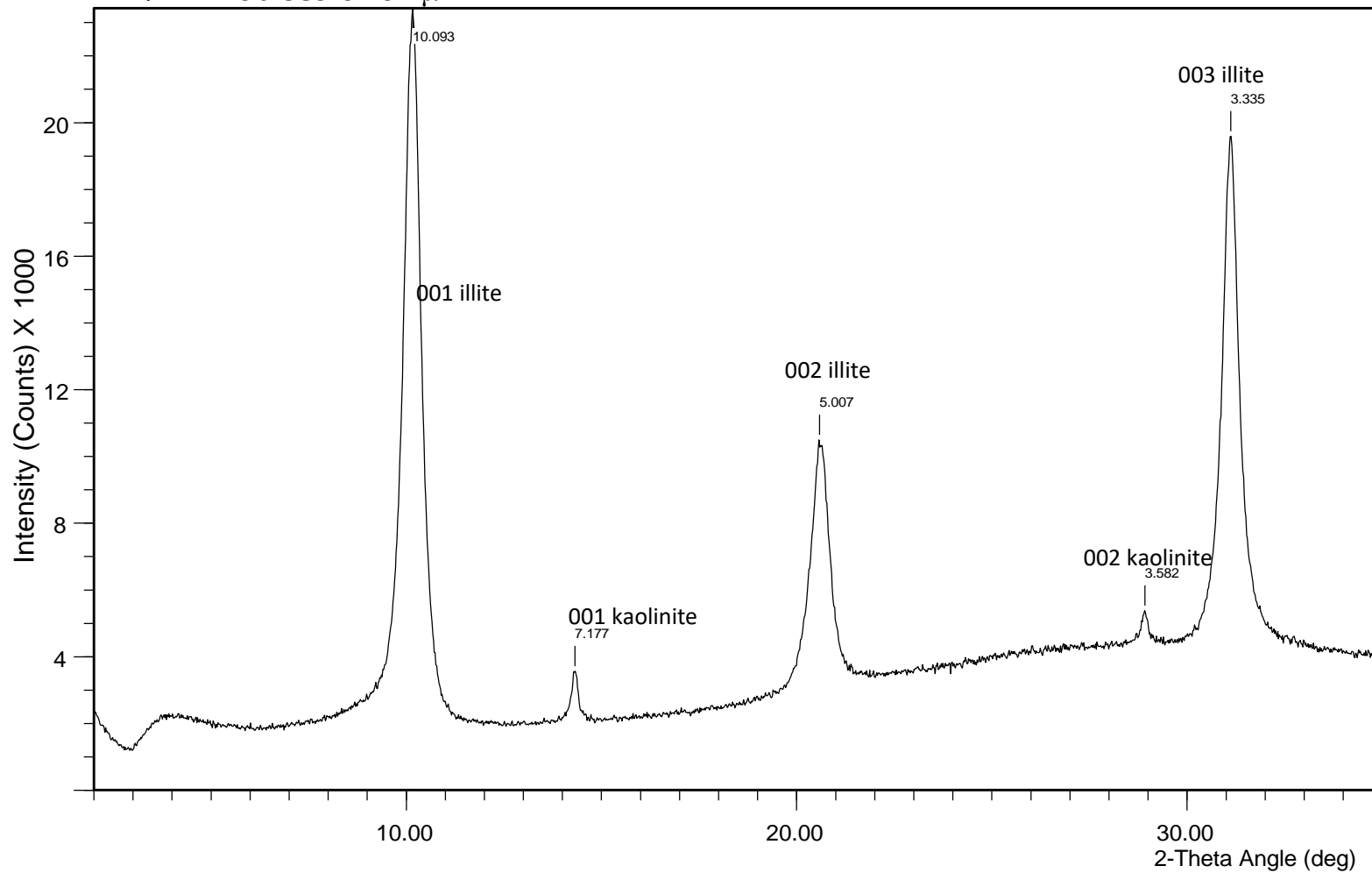
File Name: c:\data\tonguc-clays\milungerabasin\db389-1.cpi

Sample ID Dob-389.6 0.5-0.1 μ m



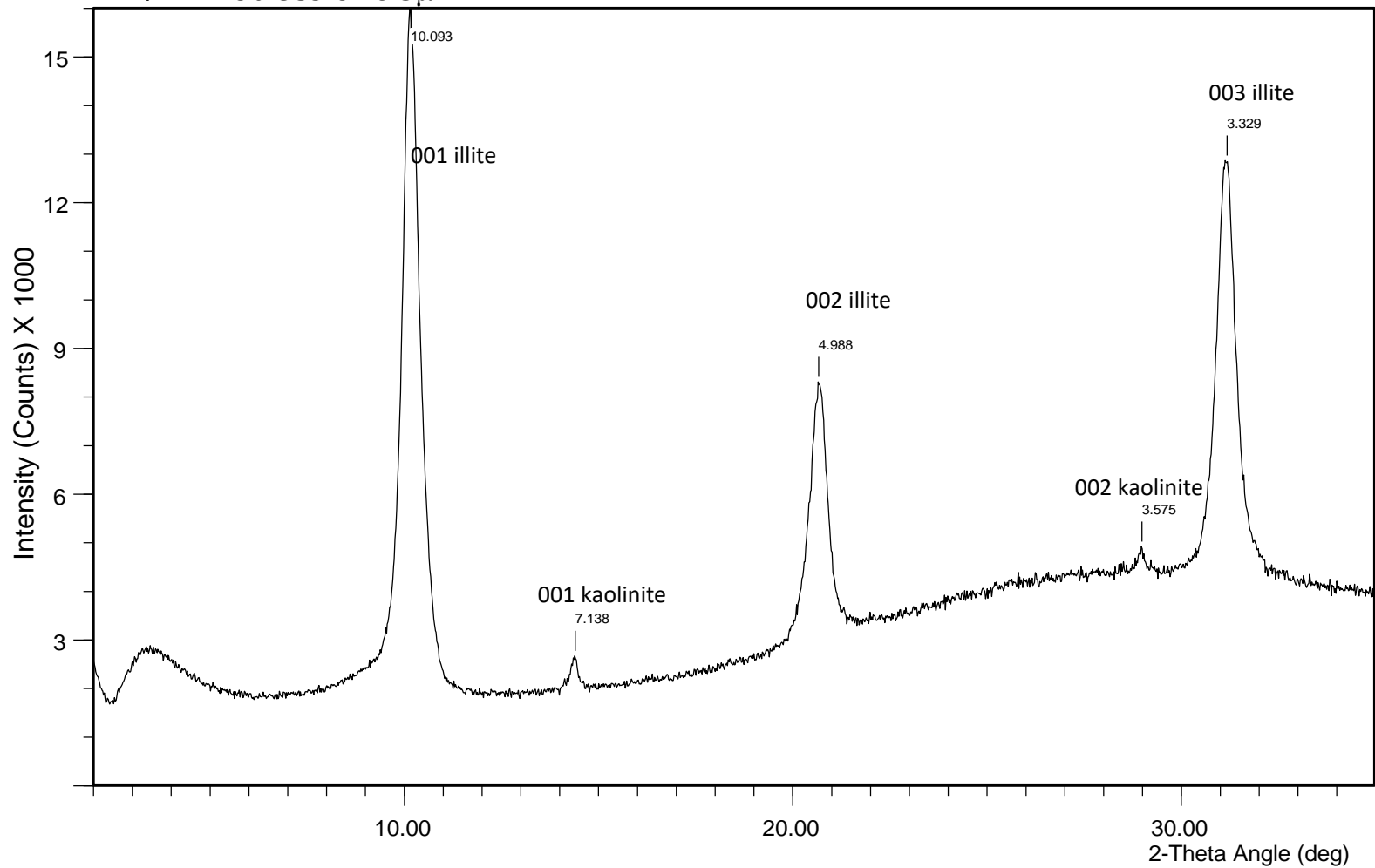
File Name: c:\...\milungerabasin\db389.6 0.5-0.1ad.cpi

Sample ID Dob-389.6 <0.1 μ m



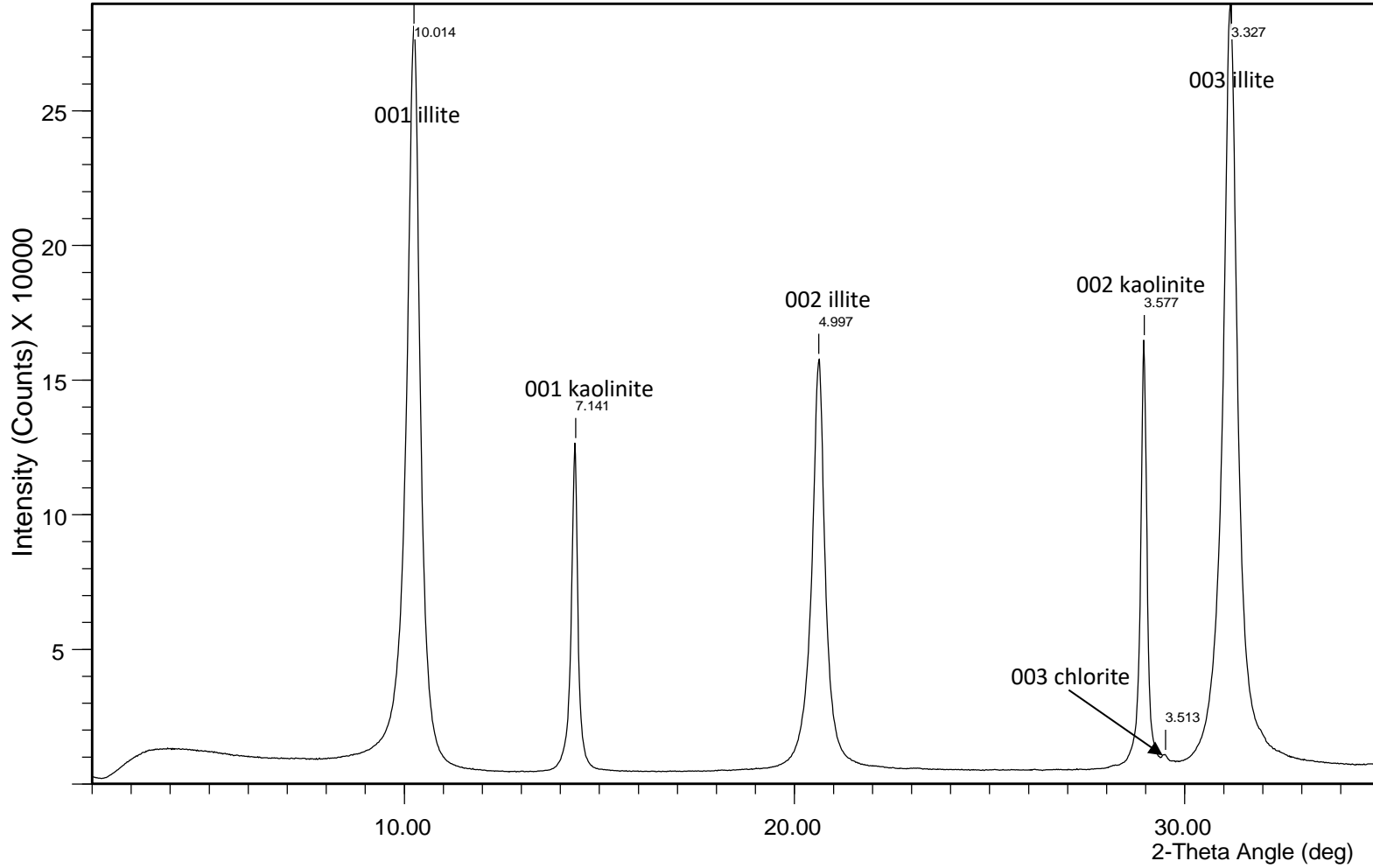
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Sample ID Dob-389.6 <0.5 μ m



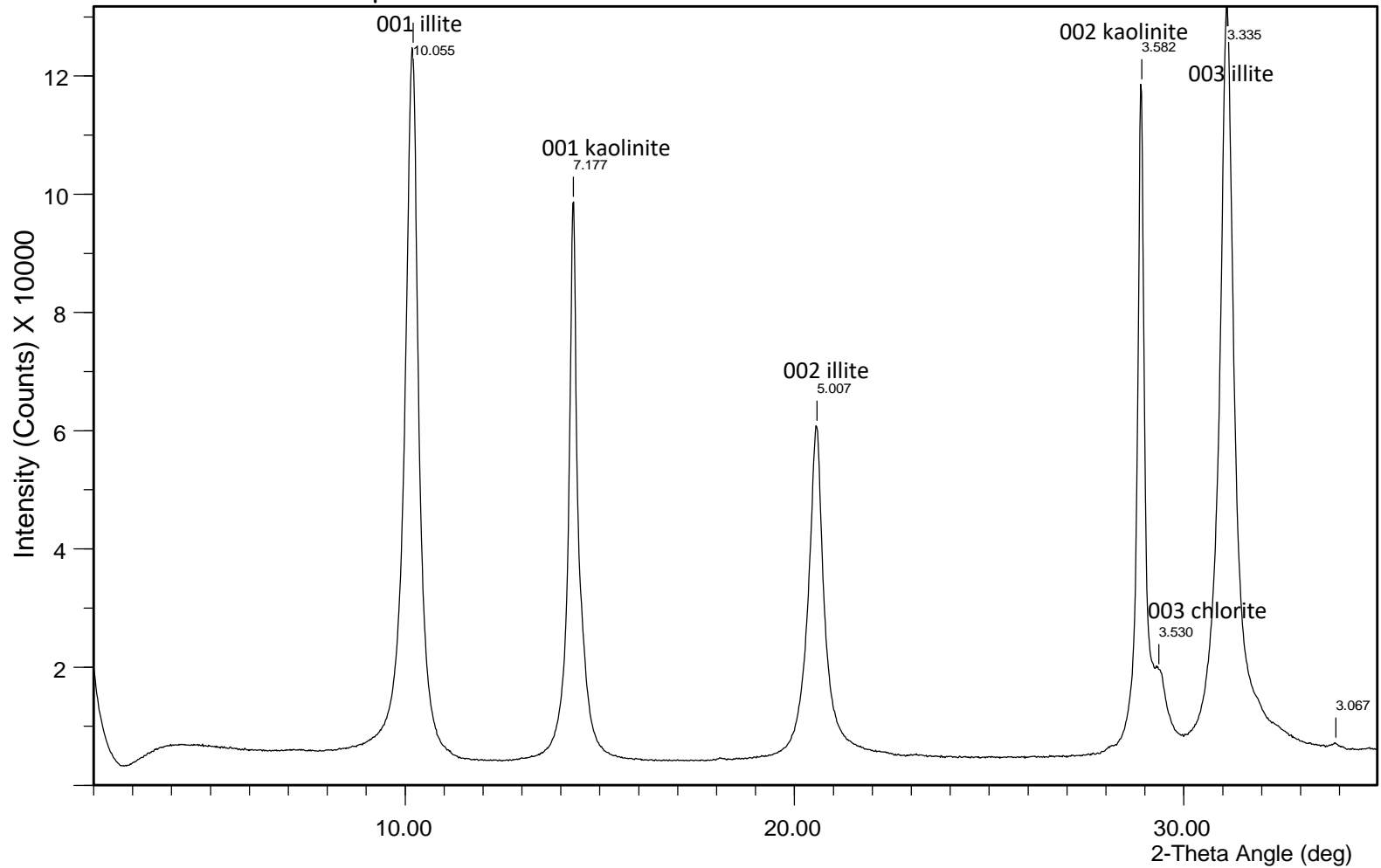
File Name: c:\...\milungerabasin\db389.6-0.5ad.cpi

Sample ID Dob-389.6 2-1 μ m



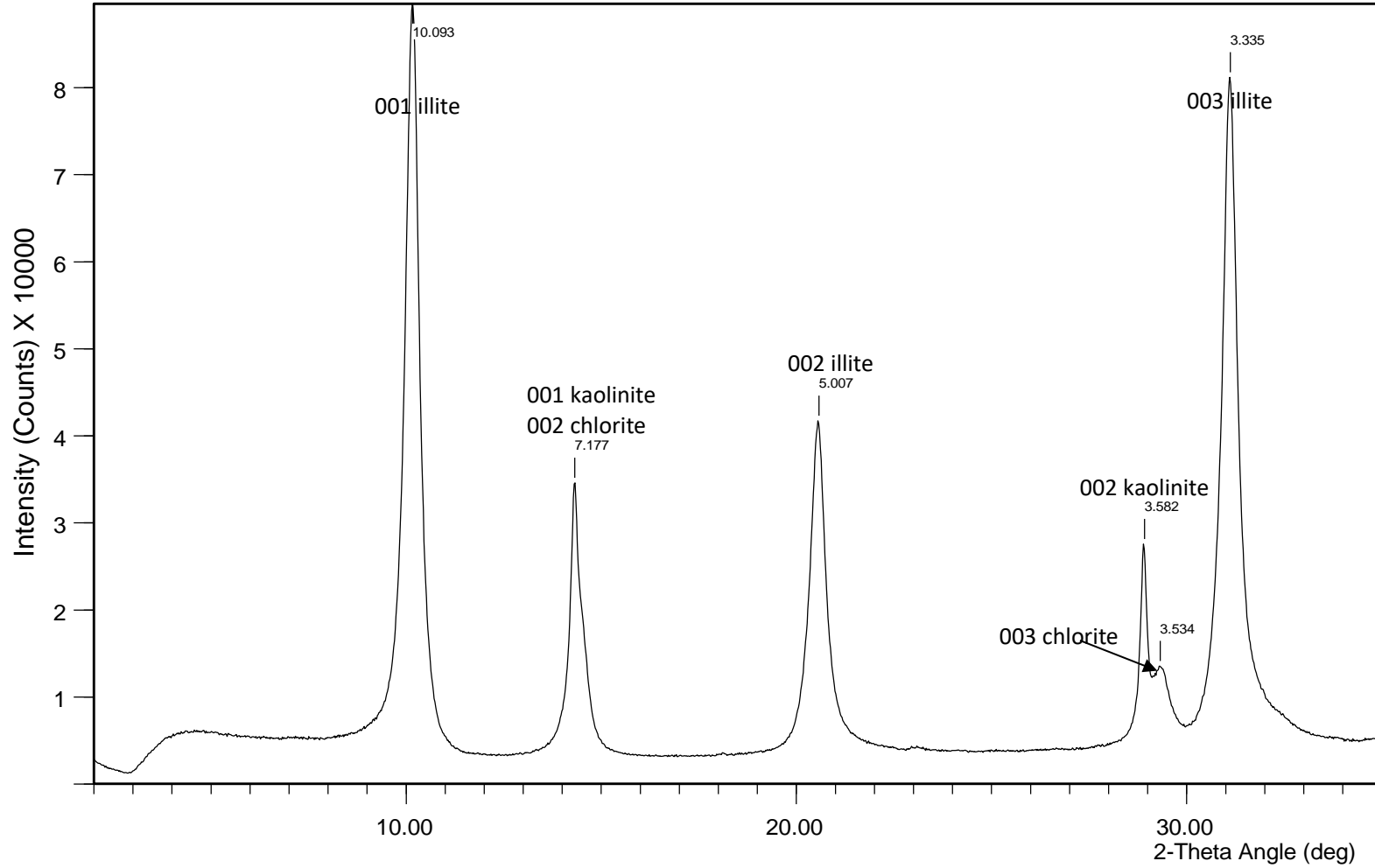
File Name: c:\data\tonguc-clays\milungerabasin\db389ad2-1.cpi

Sample ID Dob-441 <2μm



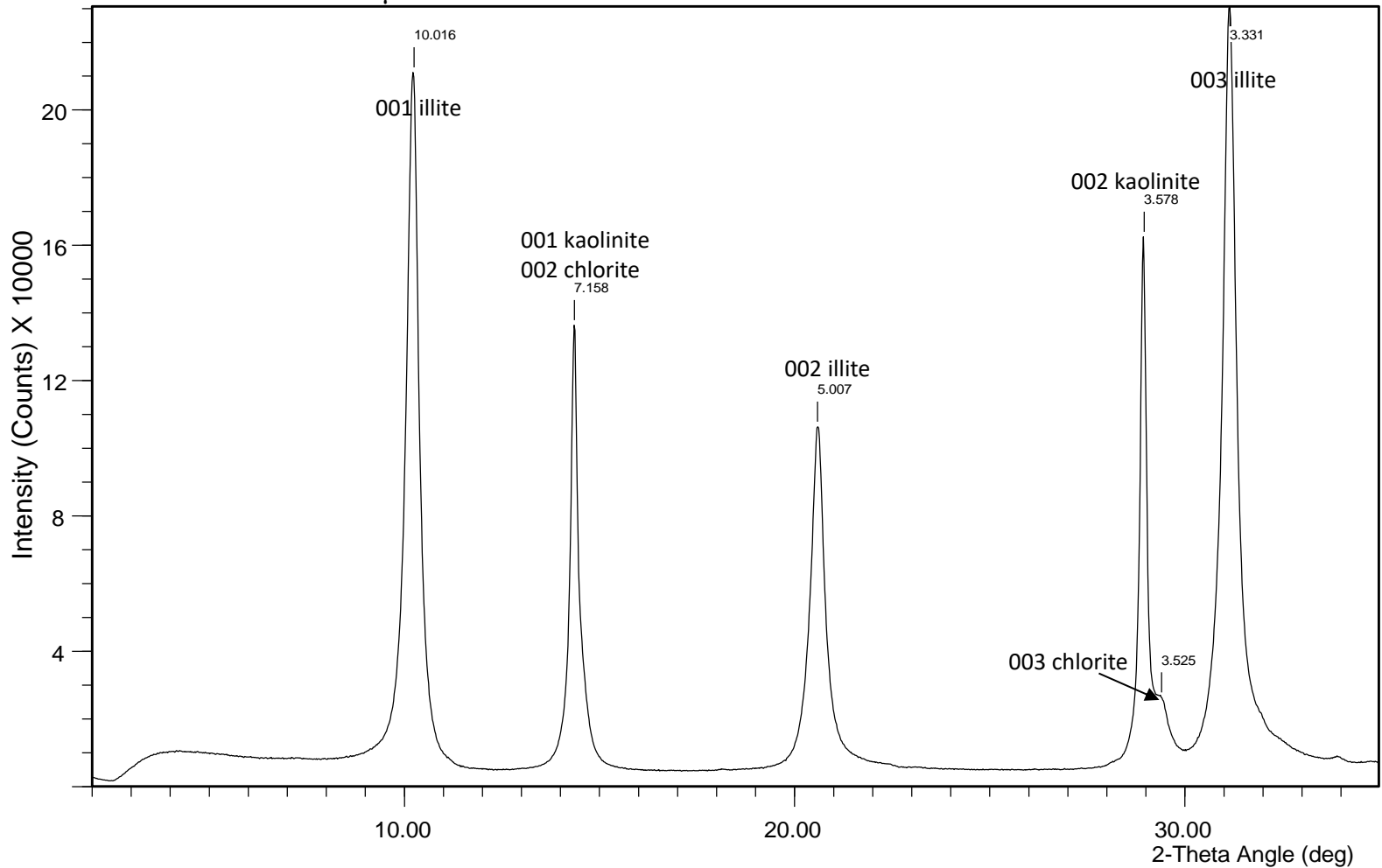
File Name: c:\data\tonguc-clays\milungerabasin\db441-2ad.cpi

Sample ID Dob-441 <1 μ m



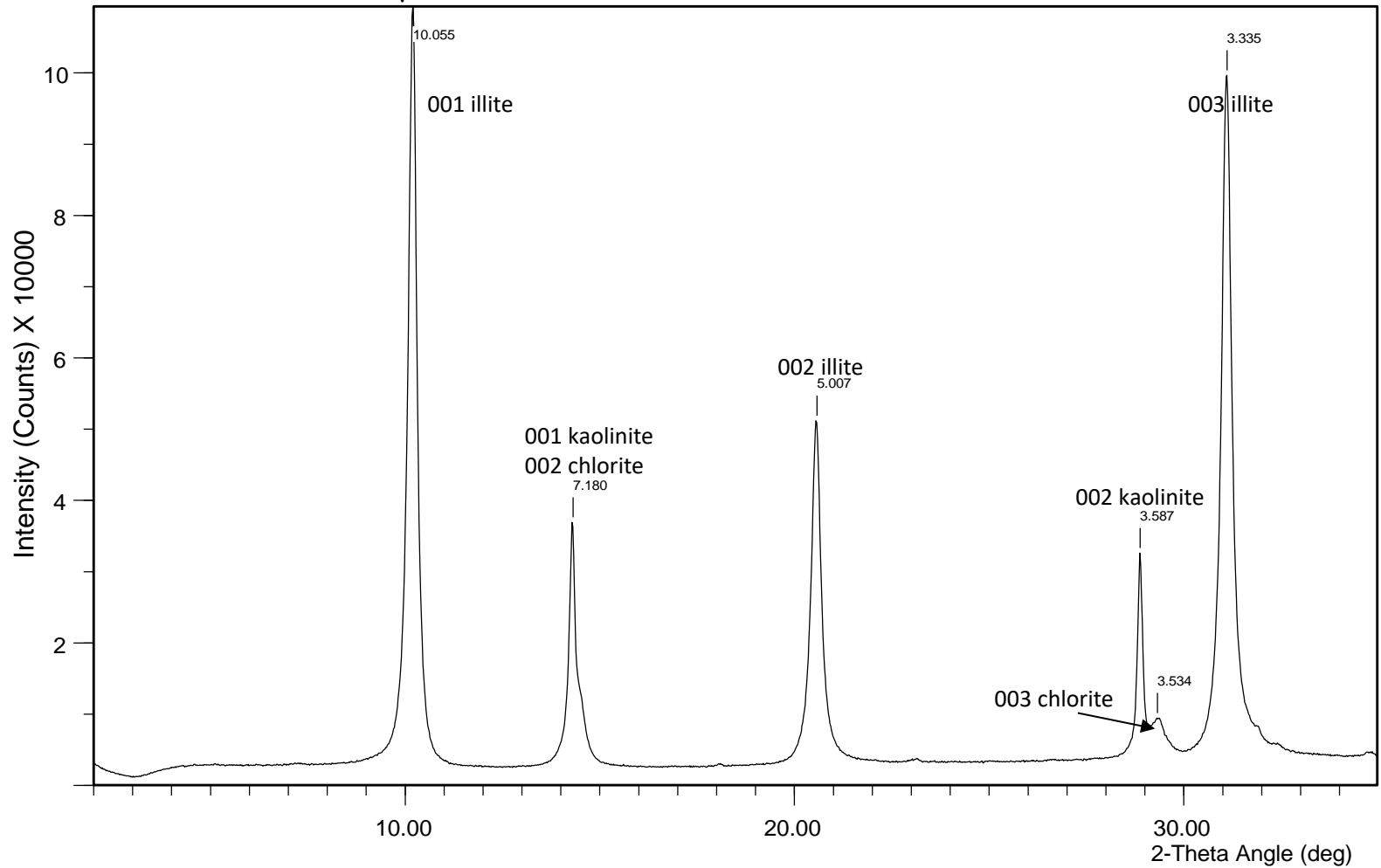
File Name: c:\data\tonguc-clays\milungerabasin\db441-1.cpi

Sample ID Dob-441 2-1 μ m



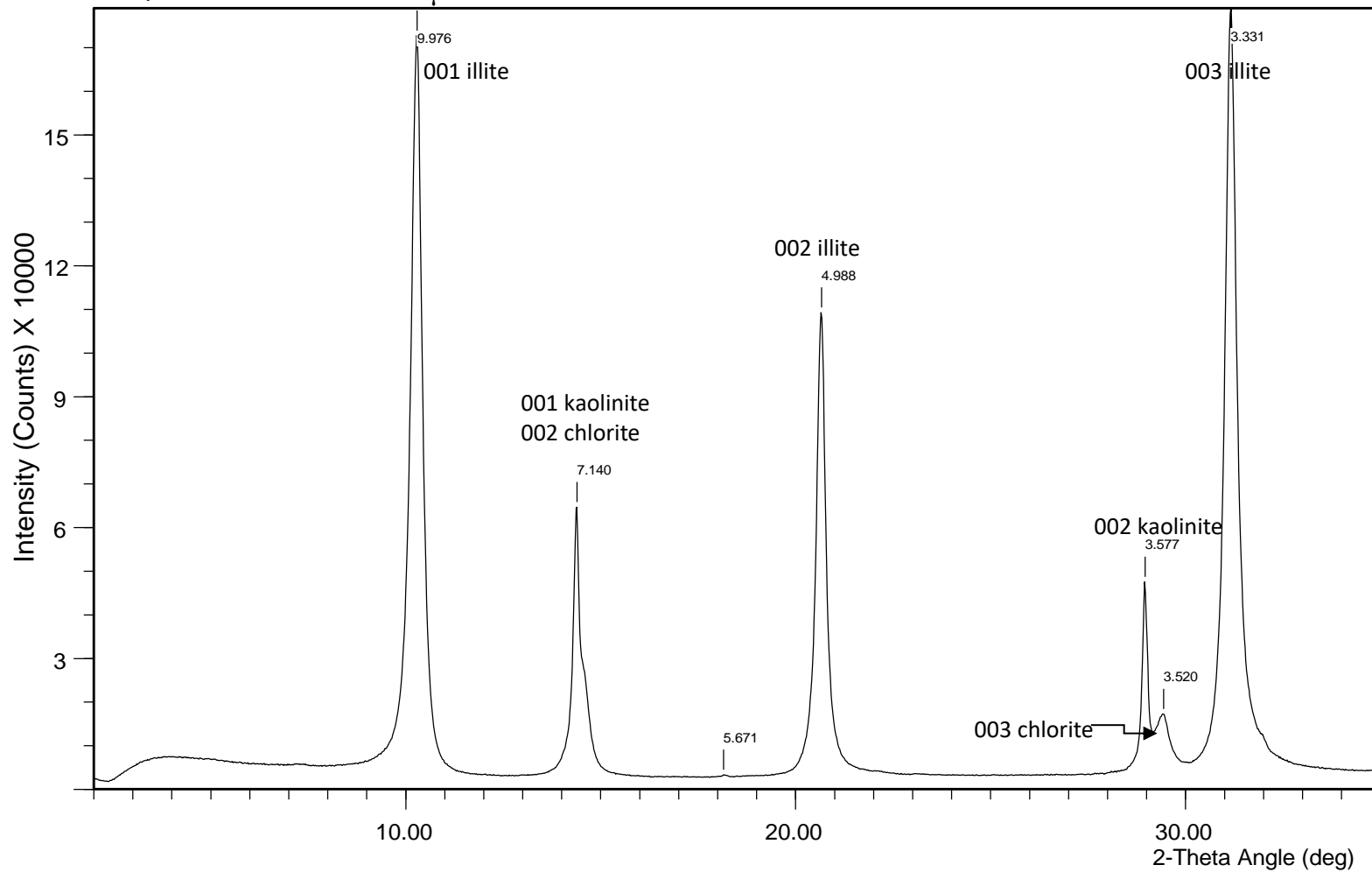
File Name: c:\data\tonguc-clays\milungerabasin\db441ad2-1.cpi

Sample ID Dob-449.1 <2 μ m



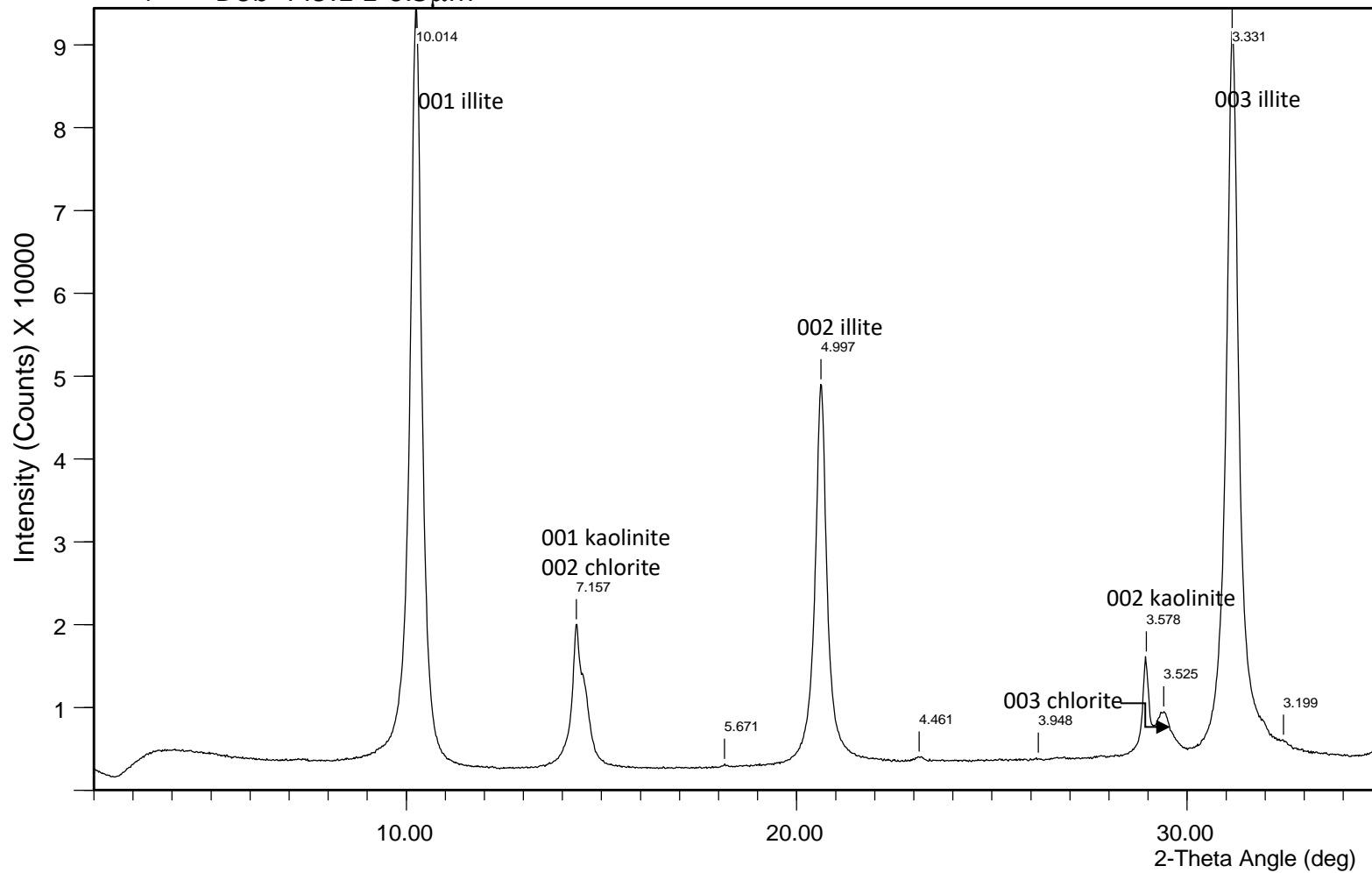
File Name: c:\...tonguc-clays\milungerabasin\db449.1ad-2.cpi

Sample ID Dob-449.1 2-0.5 μ m



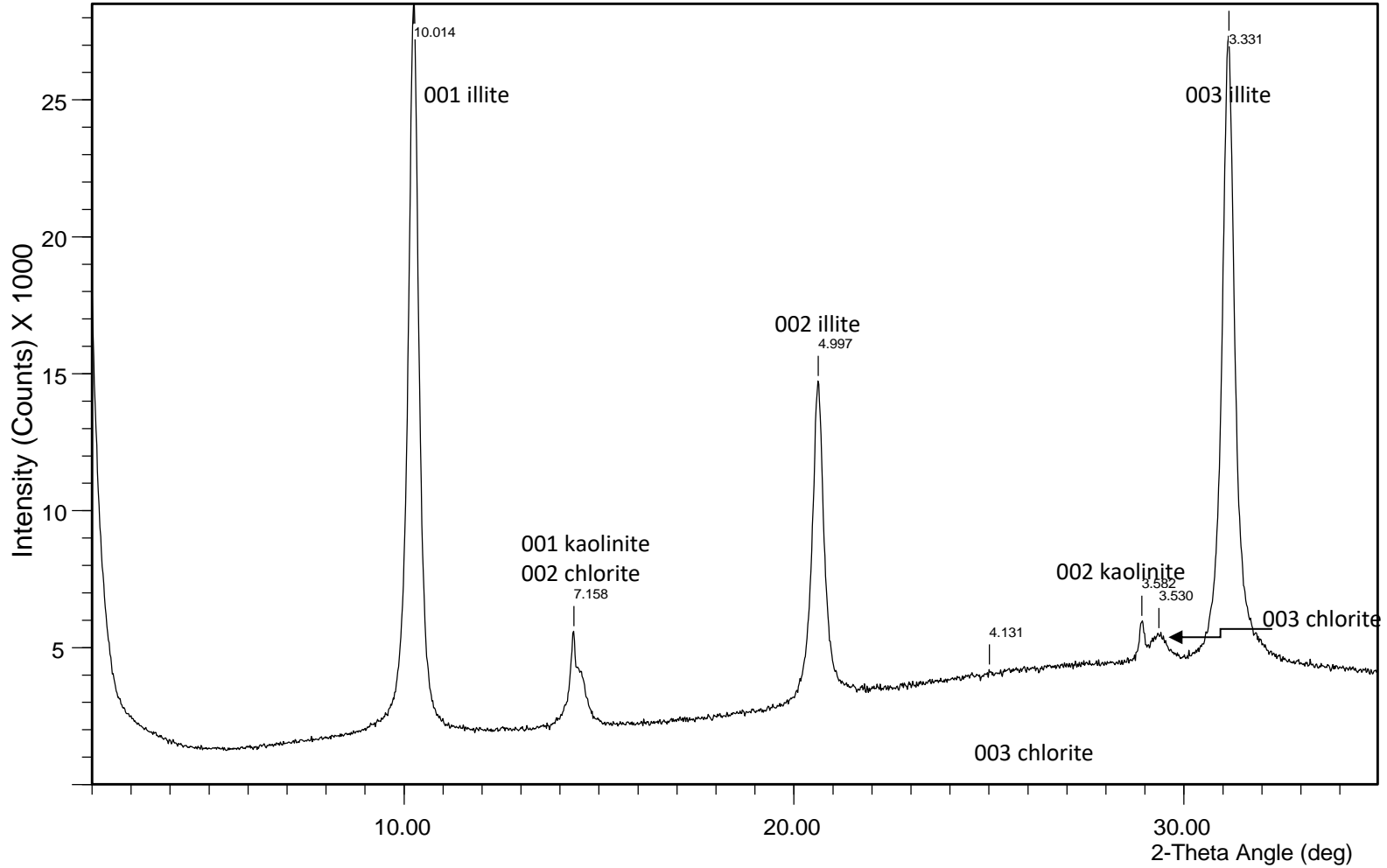
File Name: c:\...\milungerabasin\db449.1 2-0.5ad.cpi

Sample ID Dob-449.1 1-0.5 μ m



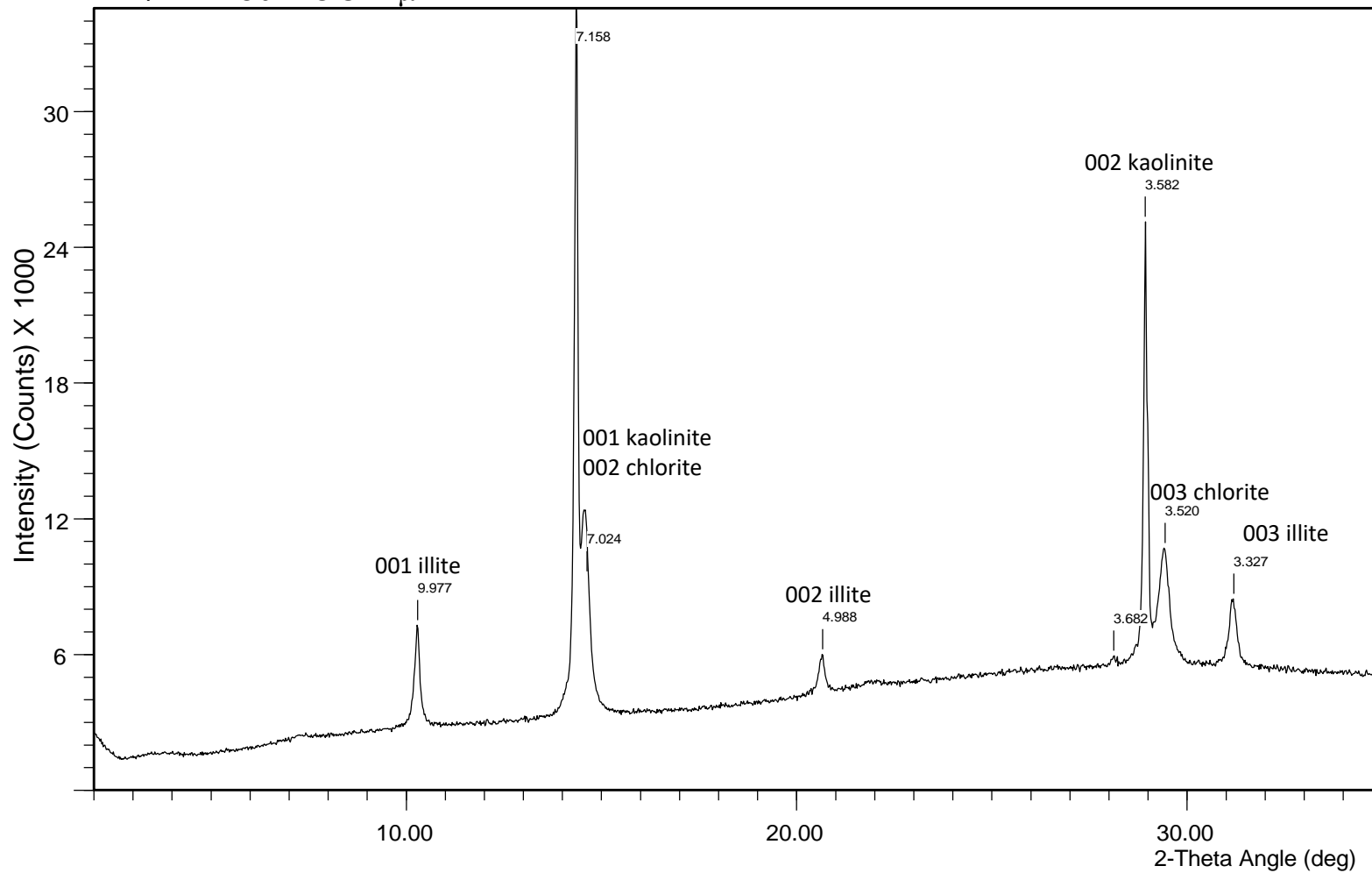
File Name: c:\...\milungerabasin\db449.1-1-0.5.cpi

Sample ID Dob-449.1 <0.5 μ m



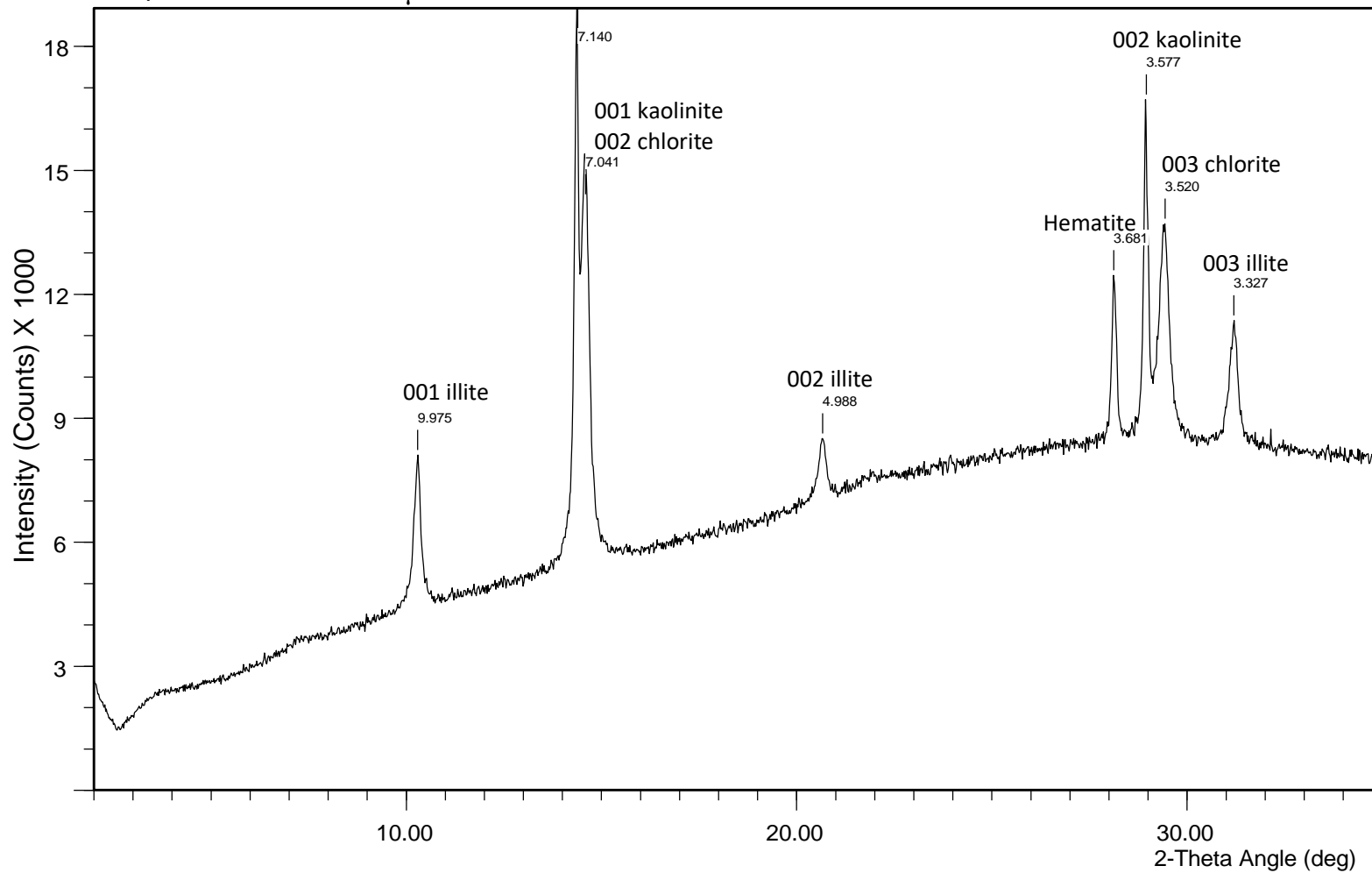
File Name: c:\...\milungerabasin\db449.1-0.5ad.cpi

Sample ID Dob-449.3 <2 μ m



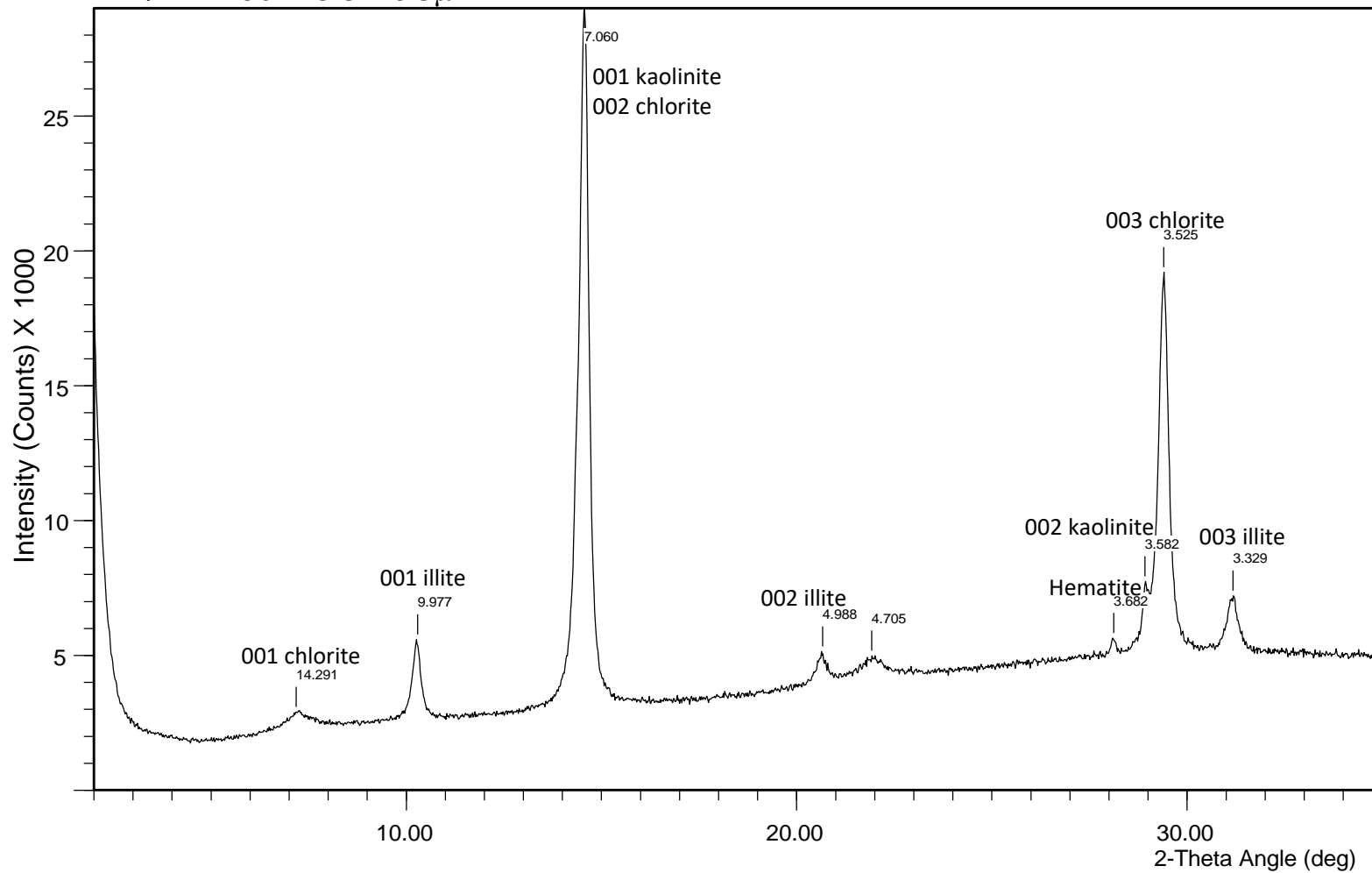
File Name: c:\...tonguc-clays\milungerabasin\db449.3-2ad.cpi

Sample ID Dob-449.3 2-1 μ m



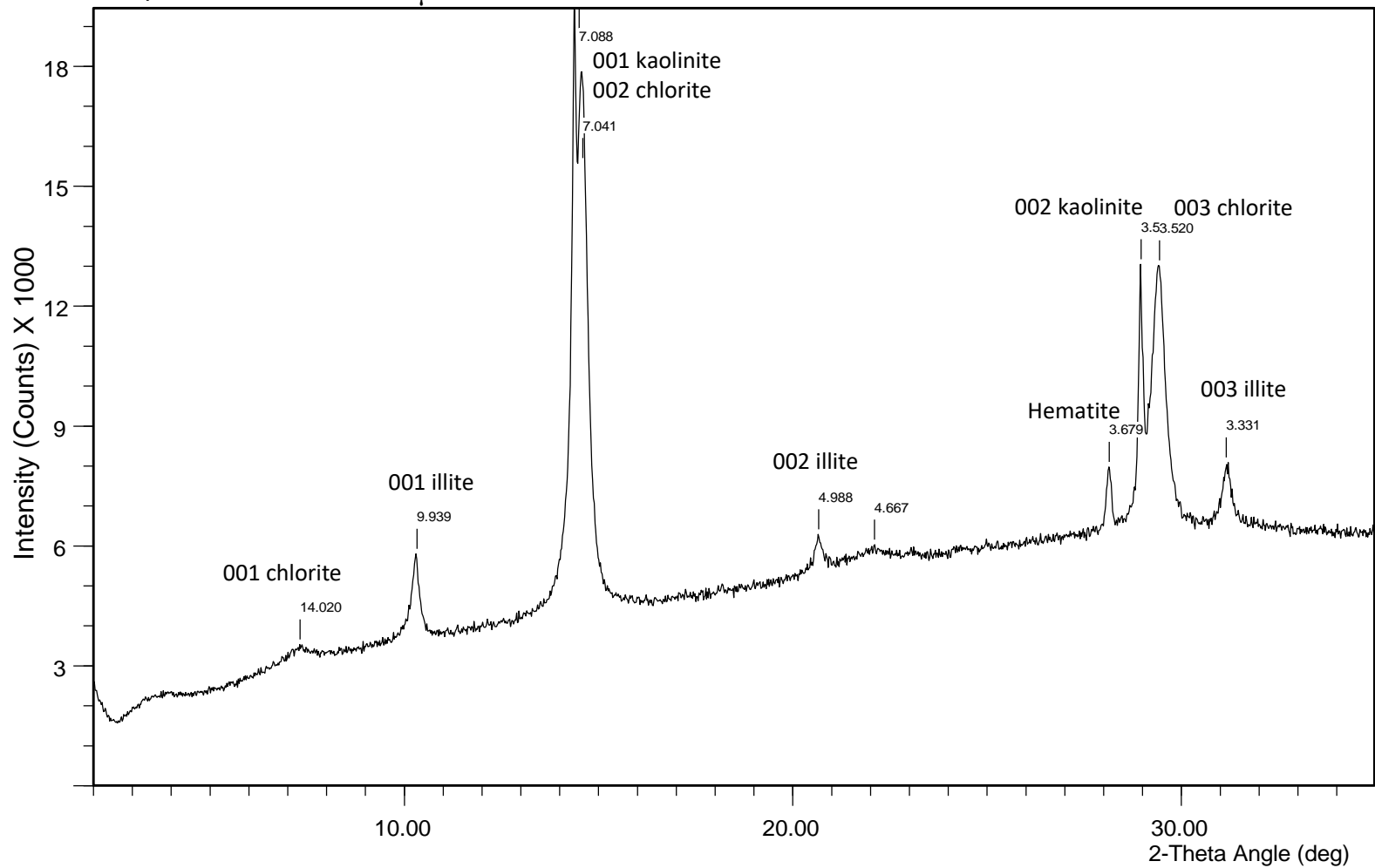
File Name: c:\...\milungerabasin\db449.3 2-1ad.cpi

Sample ID Dob-449.3 1-0.5 μ m



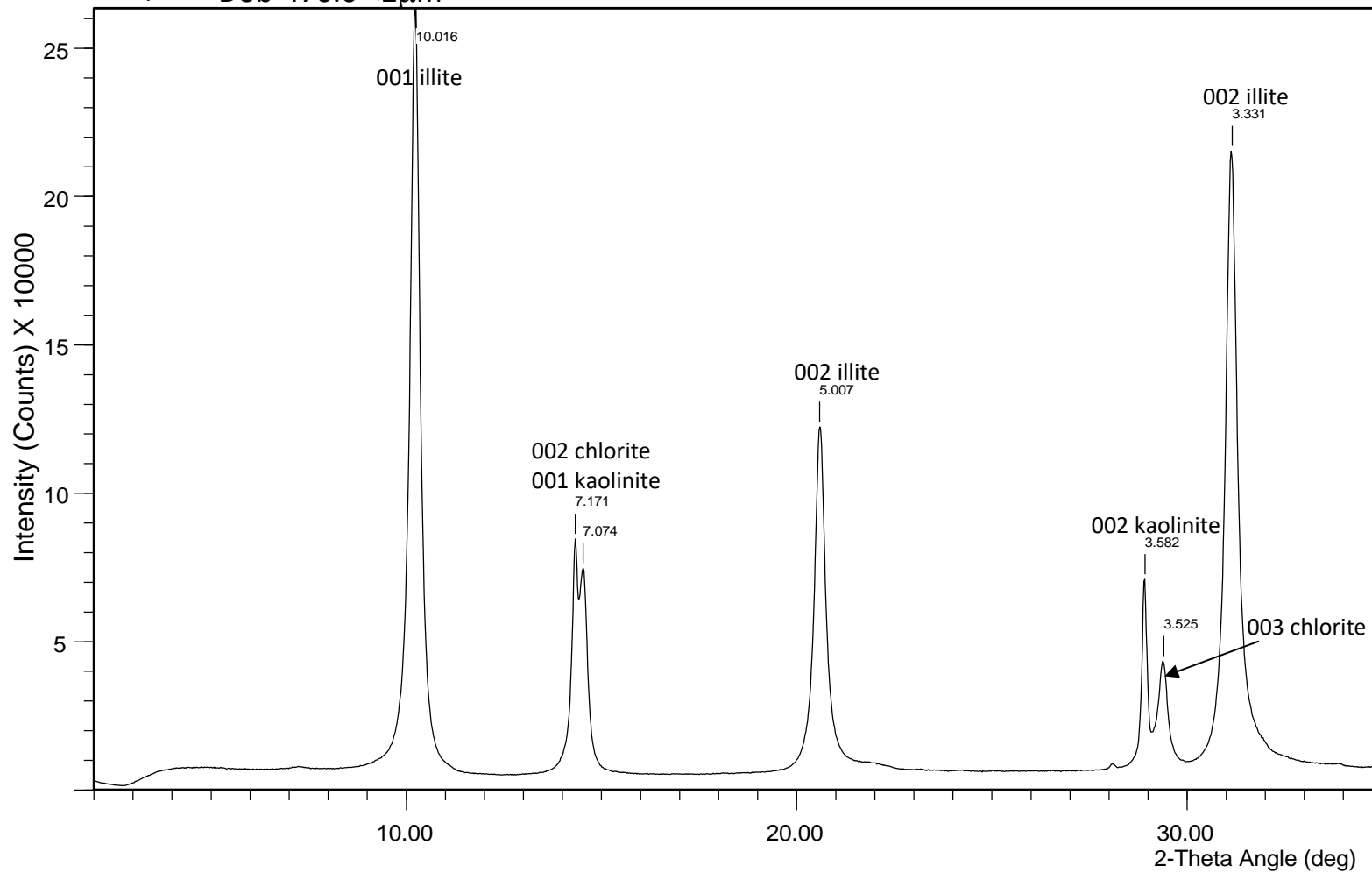
File Name: c:\...\milungerabasin\db449.3 1-0.5ad.cpi

Sample ID Dob-449.3 <0.2 μ m



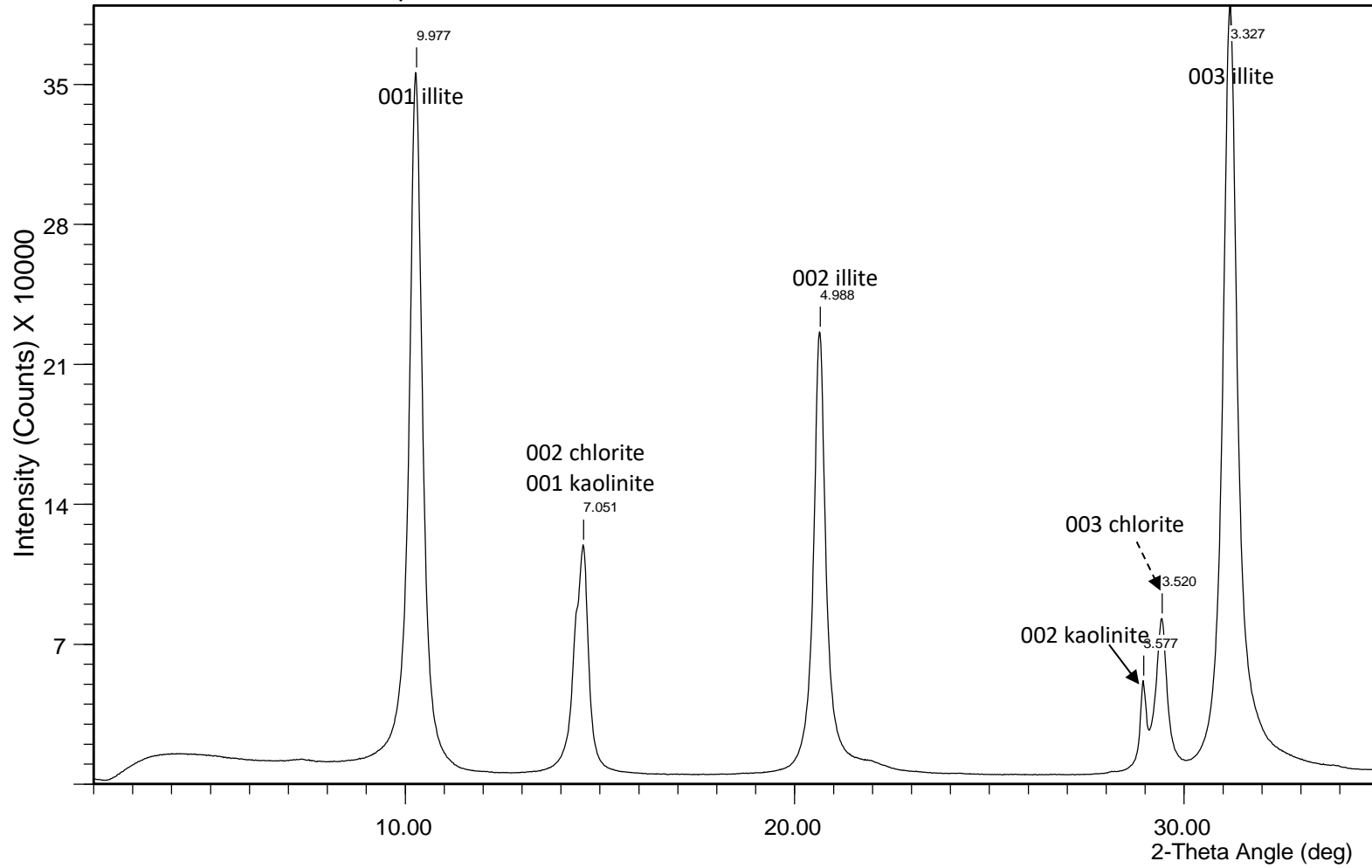
File Name: c:\...\milungerabasin\db449.3-0.2ad.cpi

Sample ID Dob-476.6 <2μm



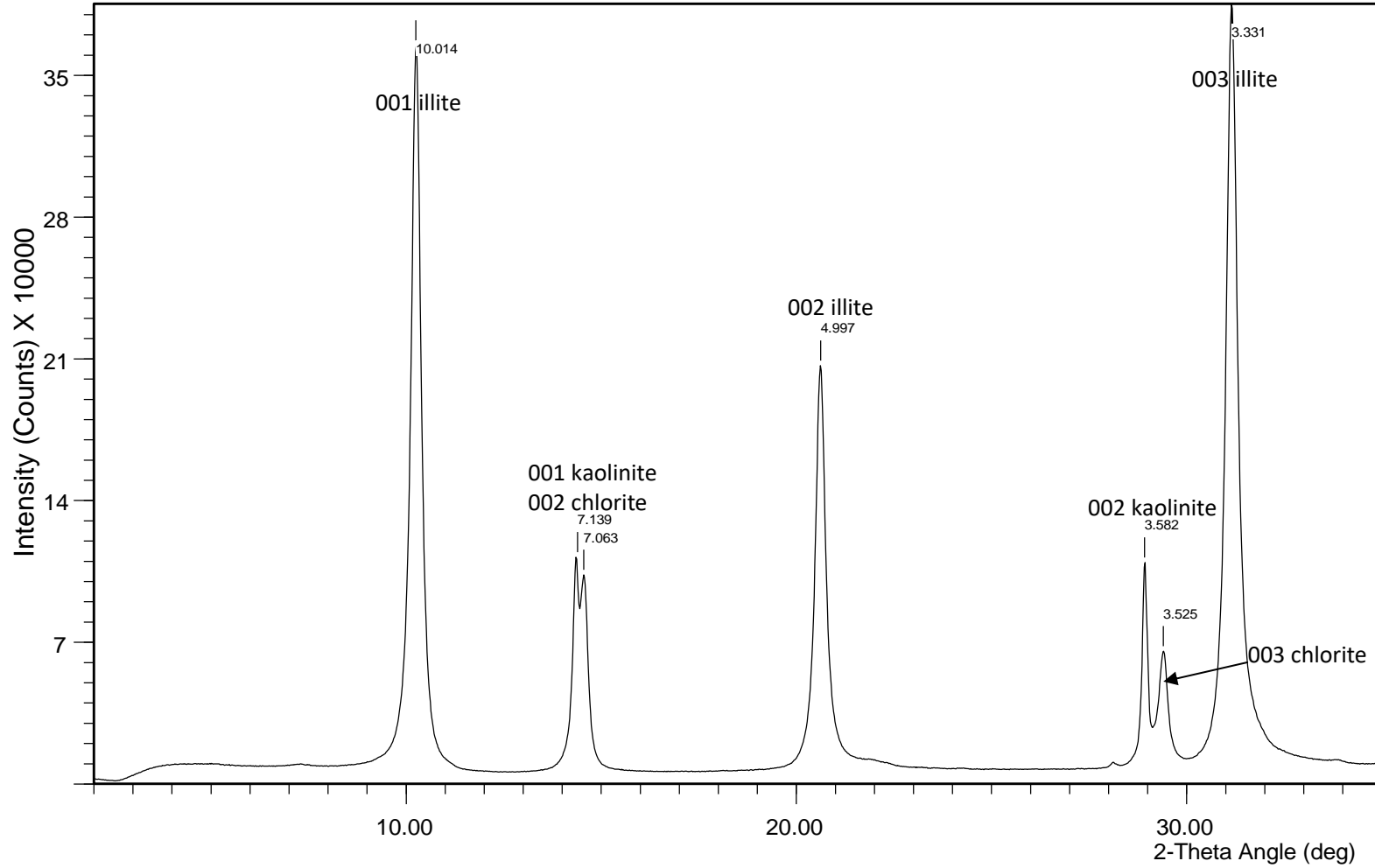
File Name: c:\data\tonguc-clays\milungerabasin\db476-2ad.cpi

Sample ID Dob-476.6 <1 μ m



File Name: c:\data\tonguc-clays\milungerabasin\db476-1.cpi

Sample ID Dob-476.6 2-1 μ m



File Name: c:\data\tonguc-clays\milungerabasin\db476ad2-1.cpi